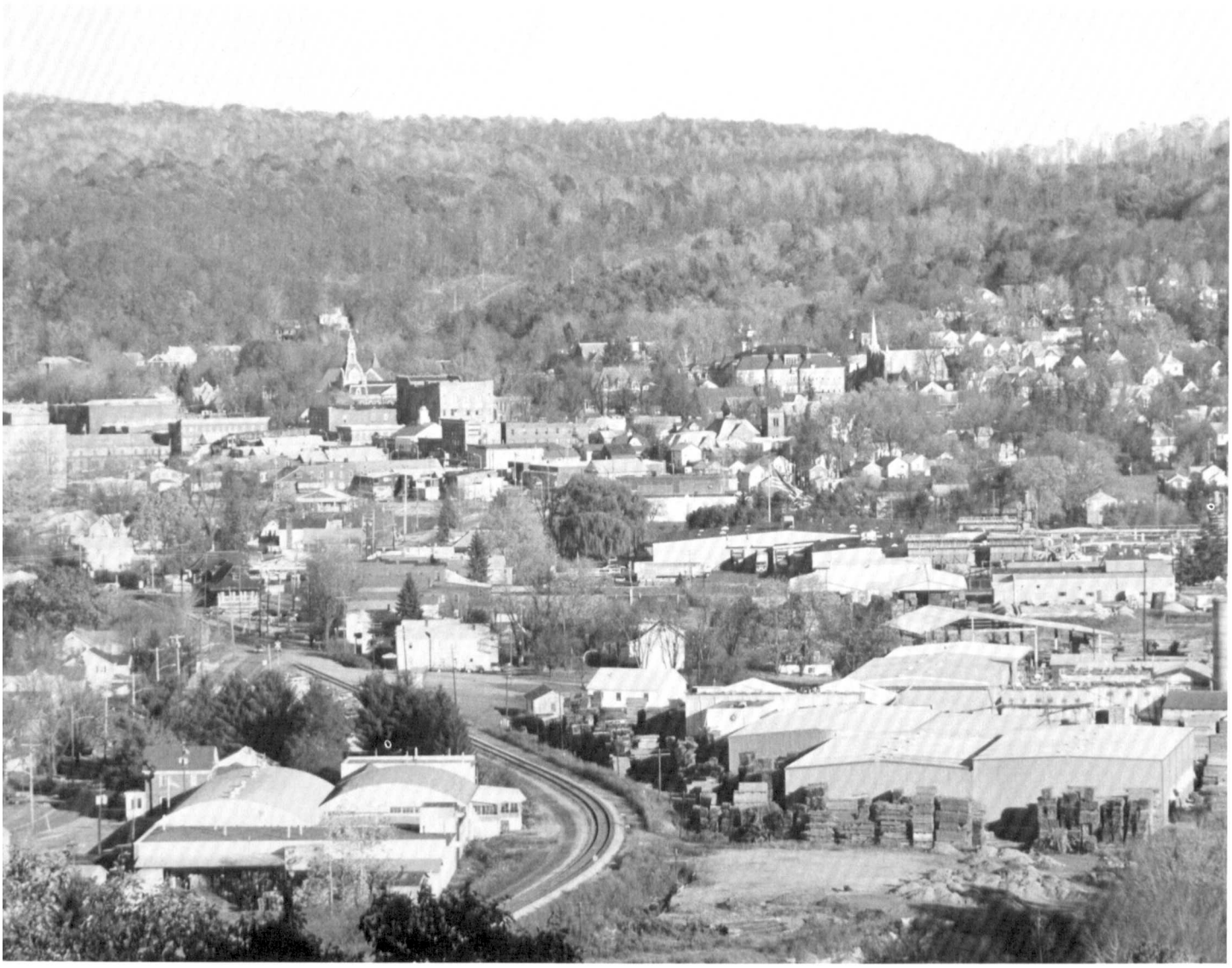
United States Department of Agriculture

Soil Conservation Service

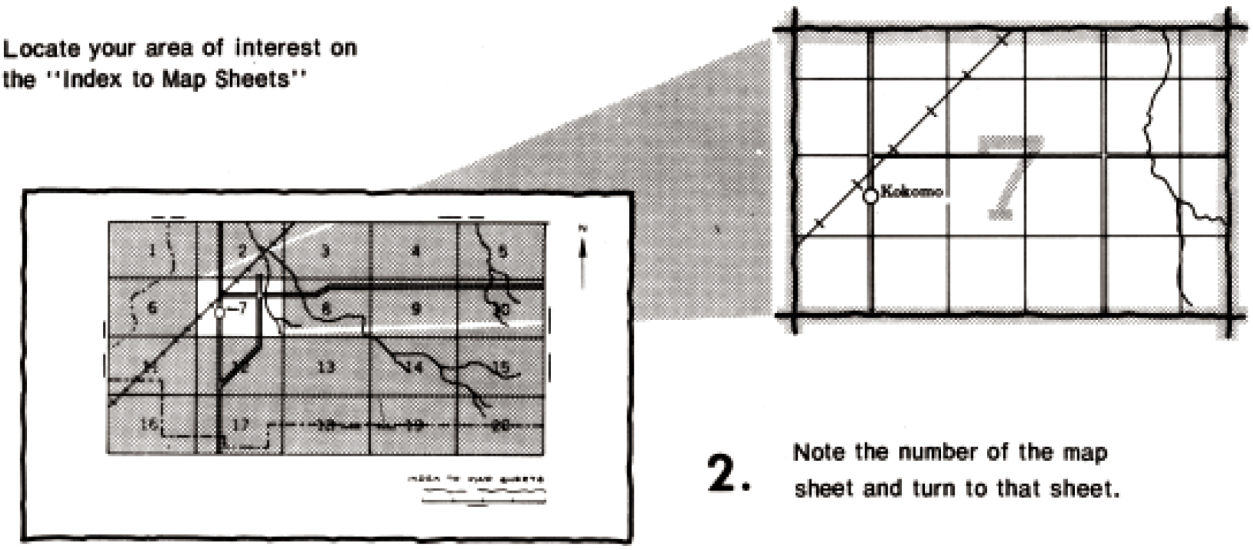
In cooperation with the Agricultural Experiment Station and Cooperative Extension Service of the College of Agriculture, the Pennsylvania State University; the Pennsylvania Department of Environmental Resources; and the Pennsylvania Department of Agriculture

Soil Survey of Cameron and Elk Counties, Pennsylvania



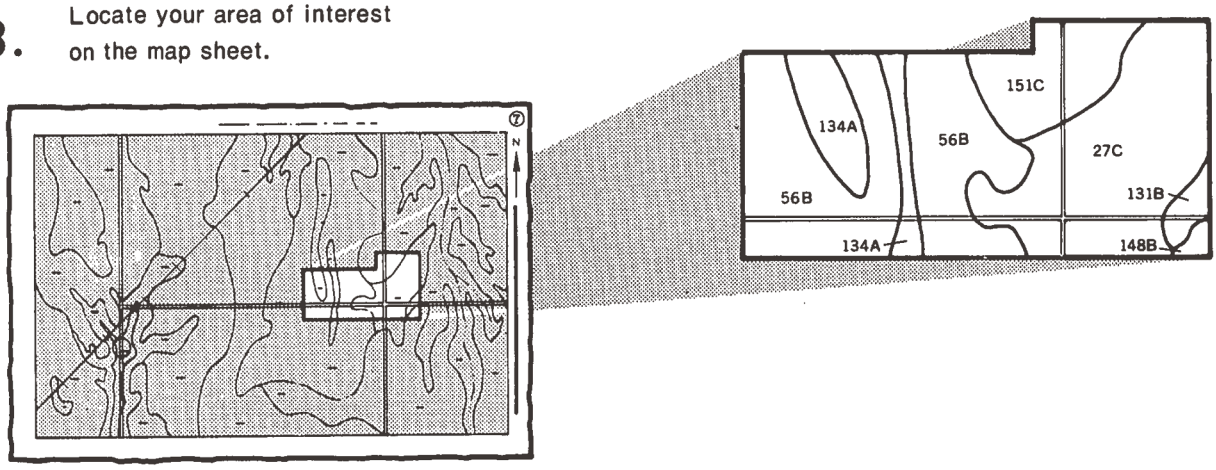
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"



2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



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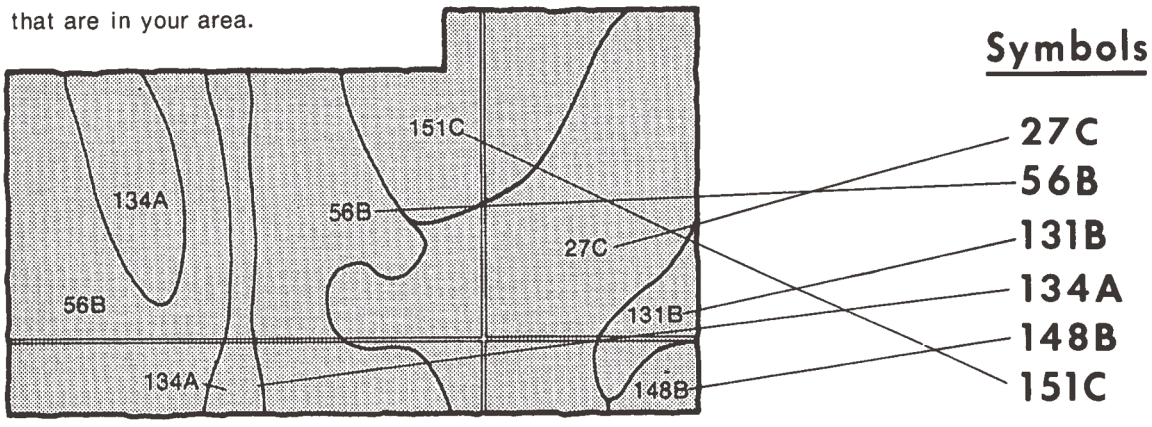
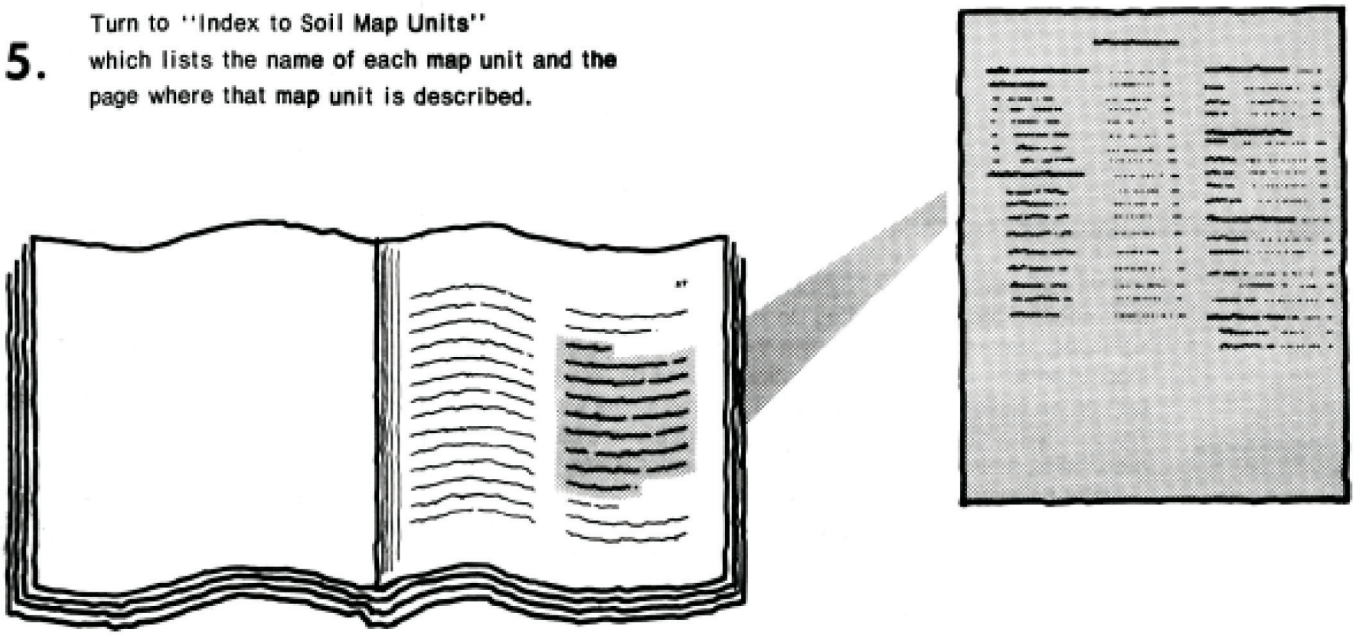
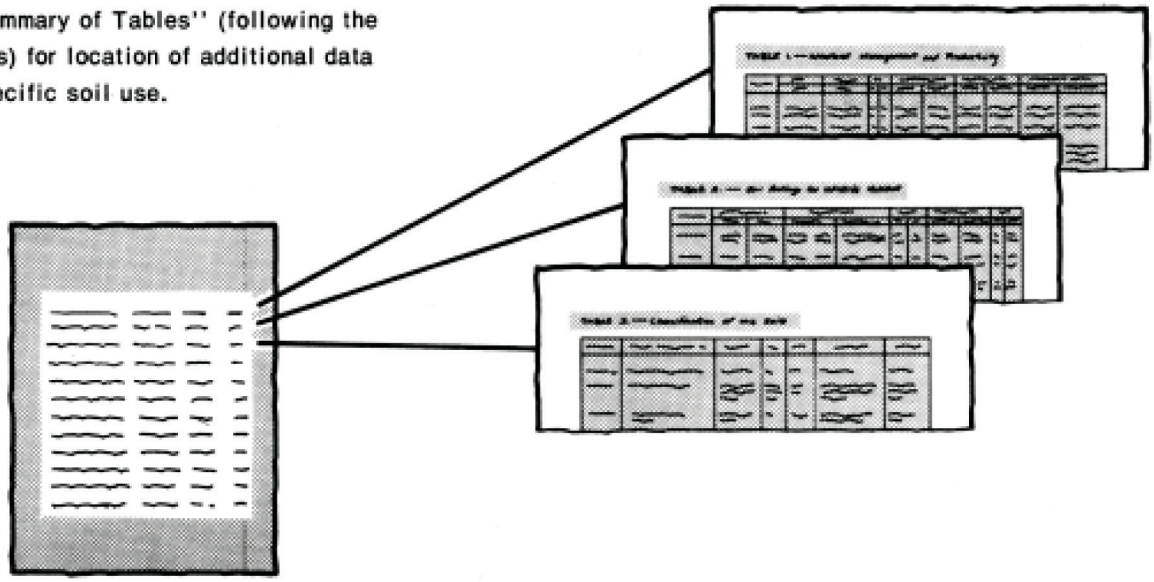


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1985. Soil names and descriptions were approved in 1986. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. This survey was made cooperatively by the Soil Conservation Service; the Agricultural Experiment Station and Cooperative Extension Service of the College of Agriculture, the Pennsylvania State University; the Pennsylvania Department of Environmental Resources; and the Pennsylvania Department of Agriculture. The United States Department of Agriculture, Forest Service, provided funds to assist in mapping the soils in the Allegheny National Forest. The survey is part of the technical assistance furnished to the Cameron County Conservation District and the Elk County Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Ridgway, the county seat of Cameron County, is important to timbering and related industries. Hartleton soils are on the hillside in the background. Buchanan and Wharton soils are in the urban areas in the foreground.

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Issued February 1993

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Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Cameron and Elk Counties. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Richard N. Duncan
State Conservationist
Soil Conservation Service

Soil Survey of Cameron and Elk Counties, Pennsylvania

By Frank A. Kopas, Soil Conservation Service

Fieldwork by Albert D. Backer, James R. Cerutti, John T. Haagen, William R. Knight, and Frank A. Kopas, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
the Agricultural Experiment Station and Cooperative Extension Service of the College of Agriculture, the Pennsylvania State University; the Pennsylvania Department of Environmental Resources; and the Pennsylvania Department of Agriculture

CAMERON AND ELK COUNTIES are in the north-central part of Pennsylvania (fig. 1). They are bounded on the north by McKean County, on the northeast by Potter County, on the east by Clinton County, on the south by Clearfield County, on the southeast by Jefferson County, on the west by Forest County, and on the northwest by Warren County.

The survey area consists of all of Cameron and Elk Counties. It has an area of 787,700 acres, or 1,231 square miles. Cameron County, the eastern part, makes up 255,100 acres, or 35 percent, of the survey area. Elk County, the western part, makes up 532,600 acres, or about 65 percent.

Census data show that the combined population of the two counties was 45,012 in 1980 *(8)*. Cameron County had a population of 6,674. Emporium, the county seat, had a population of 2,837. Shippen Township, surrounding Emporium, had a population of 2,763. Elk County had a population of 38,338. Ridgway, the county seat, had a population of 5,604. In Elk County, St. Marys had a population of 6,147 and Benzinger Township, surrounding St. Marys, had a population of 8,808. Also in Elk County, Johnsonburg had a population of 3,938 and Fox Township had a population of 3,723.

The major industries or industrial products in the survey area are lumbering, carbon and press metal fabric, oil and gas production, tourism, and agriculture. The major employers are the manufacturing industries, manufacturers of forest products, and recreational enterprises.

The counties offer modern facilities for education, medicine, religion, communication, and recreation. Private vehicles and trucking provide most of the transportation.

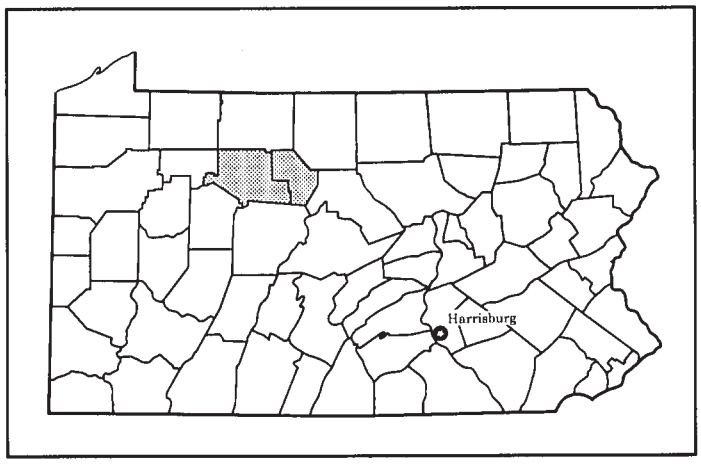

Figure 1.—Location of Cameron and Elk Counties in Pennsylvania.

Approximately 95 percent of the survey area is forested. The rest consists of farmland, small towns, and sites for industry, commerce, and community services. The survey area has many different kinds of soil. The soils formed in residual, colluvial, and alluvial material derived mainly from sandstone, siltstone, and shale. Some soils are suited to cultivated crops and urban uses. On most soils, however, the slope, the seasonal high water table, stoniness, and the depth to bedrock are limitations affecting these uses.

General Nature of the Survey Area

Bruce A. Benton, geologist, Soil Conservation Service, prepared the sections on physiography, geology, mineral resources, and water resources.

This section provides general information about the physiography, geology, mineral resources, water resources, and climate of Cameron and Elk Counties.

Physiography

The counties lie in the Allegheny Mountain section of the Appalachian Plateaus Physiographic Province. The Clarion River and Sinnemahoning Creek and their tributaries dissect the rugged topography in the Allegheny Mountain section. Elk County is less rugged than Cameron County, has a lesser degree of stream dissection, and is lower in relief. The top of the plateau averages about 1,800 feet above mean sea level (MSL). The highest elevation in the two counties is 2,370 feet above MSL at Boone Mountain in southern Elk County. The lowest elevation, 760 feet above MSL, is located where Sinnemahoning Creek leaves the southeast corner of Cameron County. Relief in the Sinnemahoning Creek Valley is about 1,300 feet.

Geology

The bedrock geology in Cameron and Elk Counties was formed during the Pennsylvanian, Mississippian, and Devonian Periods of the Paleozoic Era (about 230 million to 500 million years before the present). During this time, many advances and retreats of the sea deposited sands, silts, clays, and coals from delta, sea estuary, and swamp environments. Since then, consolidation of these sediments formed the present sequence of sedimentary rocks. The Allegheny orogeny occurred toward the end of the Paleozoic Era, in the Permian Period (about 200 million years ago). This major crustal disturbance caused intensive uplift, folding, and faulting of sediments to the southeast of the counties. In Cameron and Elk Counties, this disturbance resulted in only minor uplift and folding of sediments, causing the formation of broad anticlines and synclines. Uplift also occurred in post-Paleozoic time, adding to the present bedrock structure. The axes of the anticlines and synclines and the general bedrock strike are orientated in a northeast-southwest direction. The structures are broadly folded, and bedding is nearly horizontal.

From post-Paleozoic to the present time (200 million years), streams and tributaries have eroded and dissected the plateau, exposing several formations within the Pennsylvanian through Devonian Systems. The younger rocks are exposed along the top of the plateau, and successively older rocks are exposed on the valley walls and bottoms. Generally, the rocks with the greatest range in age are exposed in the deeper valleys with the greatest relief.

In sequence from youngest to oldest, the bedrock formations and groups in each system in the counties are described in the following paragraphs.

Pennsylvanian System.—The Glenshaw Formation, which is only in Elk County, consists of cyclic sequences of shale, sandstone, red beds, and thin beds of limestone and coal. It includes four marine limestone or shale horizons. Red beds are involved in landslides. The base is at the top of Upper Freeport coal. The Allegheny Group has cyclic sequences of sandstone, shale, limestone, clay, and coal. It includes valuable clay deposits and Vanport Limestone. Commercially valuable Freeport, Kittanning, and Brookville-Clarion coals are evident. The base of the group is at the bottom of Brookville-Clarion coal. The Pottsville Group is predominantly gray sandstone and conglomerate. It also has thin beds of shale, claystone, limestone, and coal and local areas of minable coals and commercially valuable high-alumina clays.

Mississippian System.—Burgoon Sandstone, which is only in Cameron County, is buff, medium grained, crossbedded sandstone. In places it has conglomerate at the base. It contains plant fossils.

Mississippian and Devonian Systems.—The Huntley Mountain Formation consists of greenish gray and light olive gray, flaggy, fine grained sandstone and a few red shale interbeds. It forms a transition between the Catskill Formation and Burgoon Sandstone. The Shenango-Oswayo Formations consist of undivided, greenish gray, olive, and buff sandstone and siltstone and gray shale of varying proportions.

Devonian System.—The Catskill Formation consists mainly of grayish red sandstone, siltstone, and shale. It has units of gray sandstone in the upper part. Lithologies in the upper part are arranged in fining-upward cycles. The Lock Haven Formation, which is only in Cameron County, consists of interbedded olive gray sandstone, siltstone, claystone, and thin

conglomerate. It has marine fossils throughout *(4)*.

The Glenshaw Formation crops out in scattered areas of the upland plateau in the southern part of Elk County. The Allegheny and Pottsville Groups crop out predominantly on the upland plateaus throughout the county. The Huntley Mountain Formation crops out predominantly in the valley walls and bottoms in the southeastern corner of the county. The Shenango-Oswayo Formations crop out predominantly in the valley walls and bottoms throughout the county. The Catskill Formation crops out predominantly in the valley bottoms in the southeastern part of the county *(4)*.

The Allegheny Group crops out on the upland plateaus in the central part of Cameron County. The Pottsville Group crops out on the upland plateaus in the northern, central, and eastern parts of the county. The Burgoon Sandstone crops out on the upland plateaus in the southern part of the county. The Huntley Mountain Formation crops out on the upland plateaus in the northern, central, and eastern parts of the county. The Shenango-Oswayo Formations crop out on the upland plateaus and in the tributary valleys in the northwestern part of the county. The Catskill Formation crops out on the valley walls and bottoms in the northern and southern parts of the county. The Lock Haven Formation crops out on the valley bottoms in the north-central part of the county *(4)*.

Hazleton and Cookport soils on the upland plateaus are the dominant residual soils formed in material weathered from the sandy bedrock members, and Wharton and Cavode soils are the dominant soils formed in material weathered from the shaly members.

Buchanan and Brinkerton soils formed in colluvial deposits. Barbour, Basher, Philo, and Pope soils formed in alluvial deposits on flood plains.

Mineral Resources

Cameron and Elk Counties are not major producers of mineral resources in Pennsylvania. Several bituminous coal seams of the Allegheny Group have been mined, primarily in surface-mining operations. Elk County produces about 1 percent of the bituminous coal in Pennsylvania. Cameron County reported no production *(6)*.

Elk County is the fourth-leading producer of crude oil in Pennsylvania, yielding 10.8 percent of the total state production. Its reserves are located in the Upper Devonian Bradford Sands, and most of the oil production comes from secondary recovery methods *(7)*. Cameron County does not produce oil.

Small amounts of natural gas are produced in Lower Devonian and Upper Silurian rocks, primarily in Elk County. Four active gas storage areas are located in Elk County. These are old, depleted gas reservoirs or areas of other porous rocks conducive to storage *(7)*.

Small amounts of crushed or dimension stone are produced in Elk County. Small amounts of construction sand and gravel are produced in Cameron County.

Water Resources

The Central Allegheny River Basin and the Upper West Branch Susquehanna River Basin divide the two-county area nearly in half. The Clarion River and its tributaries, the West and East Branches, drain the western half, and Sinnemahoning Creek and its tributaries, Bennett and Driftwood Branches, drain the eastern half.

In Elk County, seven public water supply companies serve approximately 70 percent of the population and private wells or springs serve the rest. The public supplies are from reservoirs, springs, and wells. They are used at a rate of about 4.7 million gallons per day *(10)*.

In Cameron County, two public water supply companies serve approximately 68 percent of the population and private wells or springs serve the rest. The public supplies are drawn from reservoirs and streams. They are used at a rate of about 530,000 gallons per day *(9)*.

Any increases in public and domestic water use in the survey area probably will be met by ground-water resources *(9)*.

Topographic setting is important in selecting well locations. Wells located in valleys generally produce higher yields than those located on the upper slopes and on hilltops. Geologic structures, such as bedrock fractures, folds, faults, and dips, can also influence ground-water yields.

Aquifers in the Glenshaw Formation and the Allegheny Group generally produce sufficient quantities for domestic and other uses that require only a small amount of water. Excessive amounts of iron and manganese are common, and the water is moderately hard and has a moderate content of dissolved solids. The Pottsville Group has aquifers that favor uses requiring a moderate or large amount of water. The content of iron and the content of manganese are high. The water is moderately hard and has a low content of dissolved solids. Burgoon Sandstone and the Huntley Mountain Formation have aquifers sufficient for public, industrial, and domestic uses. The content of iron and the content of manganese are excessive to high. The water is soft and has a low content of dissolved solids. Aquifers in the Shenango-Oswayo Formations are sufficient for uses that require only a small amount of water. The content of iron and the content of

manganese are high. The water is soft and has a moderate content of dissolved solids. Aquifers in the Catskill and Lock Haven Formations have marginally adequate supplies. The water in these aquifers generally contains iron and manganese. It is soft or moderately hard and has a moderate or relatively high content of dissolved solids *(13)*.

Climate

Prepared by the National Climatic Data Center, Asheville, North Carolina.

Winters are cold and snowy at the higher elevations in the survey area. They are frequently cold in the valleys, but intermittent thaws preclude a long-lasting snow cover. Summers are fairly warm on the mountain slopes. They are very warm and have occasional very hot days in the valleys. Rainfall is evenly distributed during the year, but it is appreciably heavier on the windward, west-facing slopes than in the valleys. The normal annual precipitation is adequate for all crops, although the summer temperature and the length of the growing season, particularly at the higher elevations, may be inadequate.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Bradford in the period 1957 to 1981. Bradford, in McKean County, Pennsylvania, is to the north of the survey area. Its climate is similar to that of Cameron and Elk Counties, for which climatic data are not available. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 21 degrees F and the average daily minimum temperature is 13 degrees. The lowest temperature on record, which occurred at Bradford on February 11, 1979, is -30 degrees. In summer, the average temperature is 63 degrees and the average daily maximum temperature is 74 degrees. The highest recorded temperature, which occurred at Bradford on July 31, 1975, is 92 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 43 inches. Of this, about 23 inches, or nearly 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 4.91 inches on September 28, 1967. Thunderstorms occur on about 33 days each year.

The average seasonal snowfall is about 84 inches. The greatest snow depth at any one time during the period of record was 44 inches. On the average, 82 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 60 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the west. Average windspeed is highest, 9 miles per hour, in spring.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material has few or no roots or other living organisms and has been changed very little by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify

predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The boundaries of the general soil map units of Cameron and Elk Counties do not consistently match those of adjoining counties. These discrepancies result from variations in the design of soil legends and changes in the concepts of individual series in different counties. The adjacent areas in the individual counties, however, join similar kinds of soil.

Soil Descriptions

1. Hazleton-Buchanan-Cookport Association

Very deep and deep, moderately well drained and well drained, nearly level to steep soils; formed in materials weathered from sandstone and siltstone; on uplands

This association is scattered throughout the survey area. It generally is on rolling hilltops, on benches, and on steep hillsides. Buchanan and Cookport soils are on the lower slopes, and Hazleton soils are on the steeper slopes.

This association makes up about 30 percent of the survey area. It is about 49 percent Hazleton soils, 23 percent Buchanan soils, 16 percent Cookport soils, and 12 percent minor soils (fig. 2).

Hazleton soils are deep and well drained. They are channery throughout and are underlain by sandstone bedrock at a depth of about 40 to 60 inches. These soils are gently sloping to steep and generally are on hilltops and hillsides.

Buchanan soils are very deep and moderately well drained. They have a fragipan and a seasonal high water table. They are underlain by sandstone, siltstone, and shale bedrock at a depth of more than 60 inches. These soils are gently sloping to moderately steep and generally are adjacent to drainageways and on foot slopes.

Cookport soils are deep and moderately well drained. They have a fragipan and a seasonal high water table. They are underlain by sandstone and siltstone bedrock at a depth of about 40 to 60 inches. These soils are nearly level to moderately steep and generally are on broad hilltops.

The minor soils on uplands are the well drained Hartleton soils and the poorly drained Brinkerton and Nolo soils. The minor soils on flood plains are the well drained Pope soils, the moderately well drained Philo soils, and the poorly drained Atkins soils.

Most areas of this association are used as woodland. A few areas are in farms. Some areas that formerly were farmed are reverting to indigenous trees and brush.

This association has good potential for use as woodland and as habitat for wildlife. It has fair potential for urban and farm uses. The major limitations affecting urban uses are the seasonal high water table, restricted permeability, the slope, and stoniness.

2. Hazleton-Cookport-Buchanan Association

Very deep and deep, moderately well drained and well drained, nearly level to very steep soils; formed in materials weathered from sandstone and siltstone; on uplands

This association is scattered throughout the survey area. It generally is on rolling foot slopes and benches. Hazleton soils are mainly on side slopes. Cookport soils are on broad ridgetops and benches. Buchanan soils generally are on foot slopes.

This association makes up about 26 percent of the

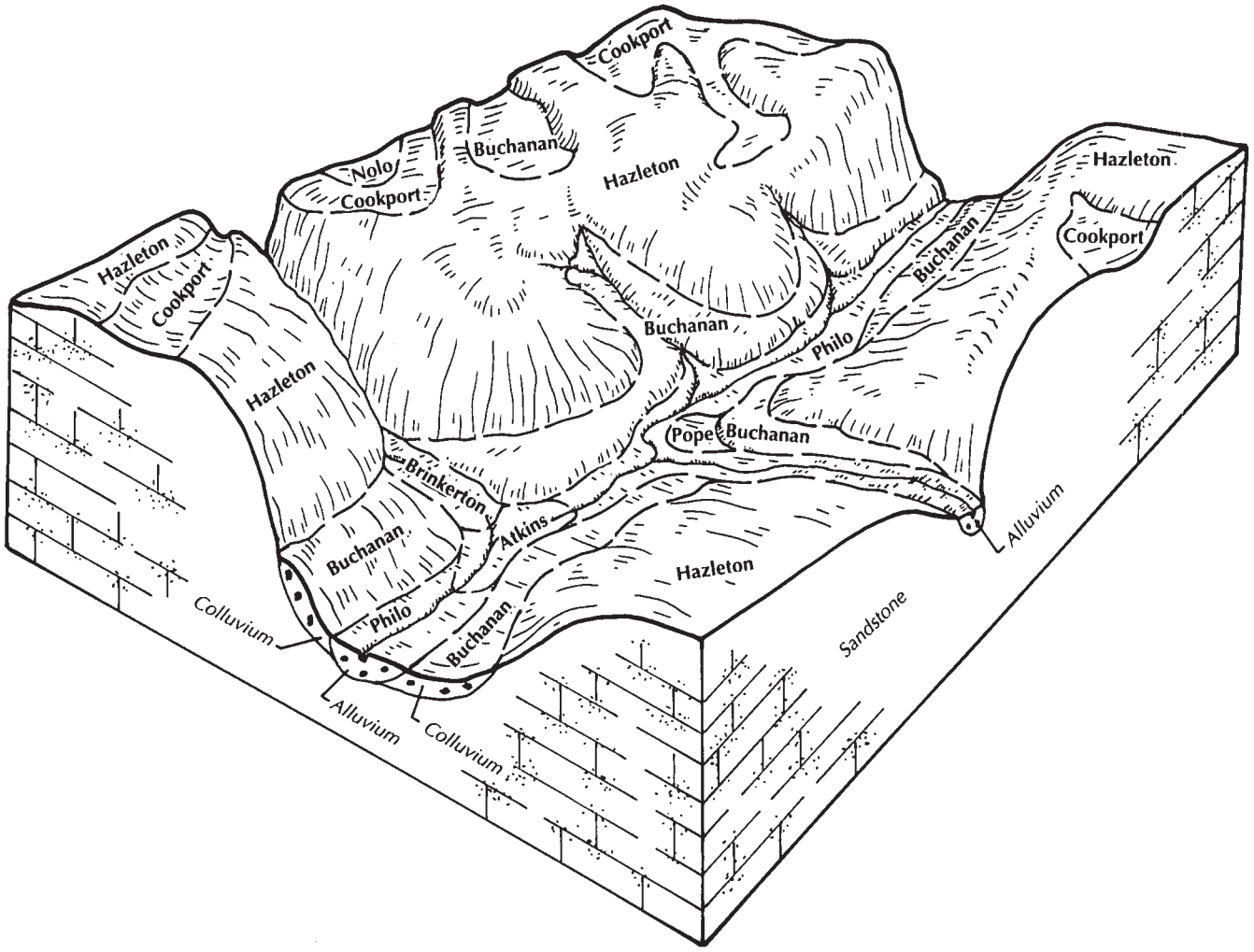

Figure 2.—Typical pattern of soils and underlying material in the Hazleton-Buchanan-Cookport association.

survey area. It is about 42 percent Hazleton soils, 32 percent Cookport soils, 11 percent Buchanan soils, and 15 percent soils of minor extent (fig. 3).

Hazleton soils are deep and well drained. They are channery throughout and are underlain by sandstone bedrock at a depth of about 40 to 60 inches. These soils are gently sloping to very steep and are on hilltops and hillsides.

Cookport soils are deep and moderately well drained. They have a fragipan and a seasonal high water table. They are underlain by sandstone and siltstone bedrock at a depth of more than 40 inches. These soils are nearly level to moderately steep and are on uplands.

Buchanan soils are very deep and moderately well drained. They have a fragipan and a seasonal high water table. They are underlain by sandstone, siltstone, and shale bedrock at a depth of more than 60 inches. These soils are nearly level to moderately steep and are in drainageways and on foot slopes.

The minor soils on uplands are the well drained Hartleton soils and the poorly drained Brinkerton and Nolo soils. The minor soils on flood plains are the well drained Pope soils, the moderately well drained Philo soils, and the poorly drained Atkins soils.

Most areas of this association are used as woodland. A few areas are in farms. Some areas that formerly were farmed are reverting to indigenous brush and trees.

This association has good potential for use as woodland and as habitat for wildlife. It has fair potential for urban and farm uses. The major limitations affecting urban uses are the seasonal high water table, restricted permeability, the slope, and stoniness.

3. Hartleton-Wharton-Buchanan Association

Very deep and deep, moderately well drained and well drained, gently sloping to very steep soils; formed in materials weathered from siltstone and shale; on uplands

This association is mainly in an area extending from Brockport to East Branch Dam in Elk County and in the west-central and central parts of Cameron County. The association generally is on broad hilltops, hillsides, and foot slopes (fig. 4).

This association makes up about 23 percent of the survey area. It is about 57 percent Hartleton soils, 24 percent Wharton soils, 7 percent Buchanan soils, and 12 percent soils of minor extent.

Hartleton soils are deep and well drained. They are channery throughout and are underlain by siltstone and sandstone bedrock at a depth of 40 to 60 inches. These soils are gently sloping to very steep and generally are on hilltops and hillsides.

Wharton soils are deep and moderately well drained. They have a seasonal high water table. They are underlain by siltstone and shale bedrock at a depth of about 40 to 60 inches. These soils are gently sloping to moderately steep and generally are on hilltops.

Buchanan soils are very deep and moderately well drained. They have a fragipan and a seasonal high water table. They are underlain by sandstone, siltstone, and shale bedrock at a depth of more than 60 inches. These soils are gently sloping to moderately steep and are in drainageways and on foot slopes.

The minor soils on uplands are the well drained Hazleton soils, the moderately well drained Cookport soils, the somewhat poorly drained Cavode soils, and the poorly drained Brinkerton soils. The minor soils on flood plains are the well drained Pope soils, the moderately well drained Philo soils, and the poorly drained Atkins soils.

Most areas of this association are used as woodland. A few areas are in farms or are developed for urban uses. Some areas that formerly were farmed are reverting to indigenous trees and brush.

This association has good potential for use as woodland and as habitat for wildlife. It has fair potential for farming and for urban uses. The major limitations affecting urban uses are the seasonal high water table, the slope, restricted permeability, and stoniness.

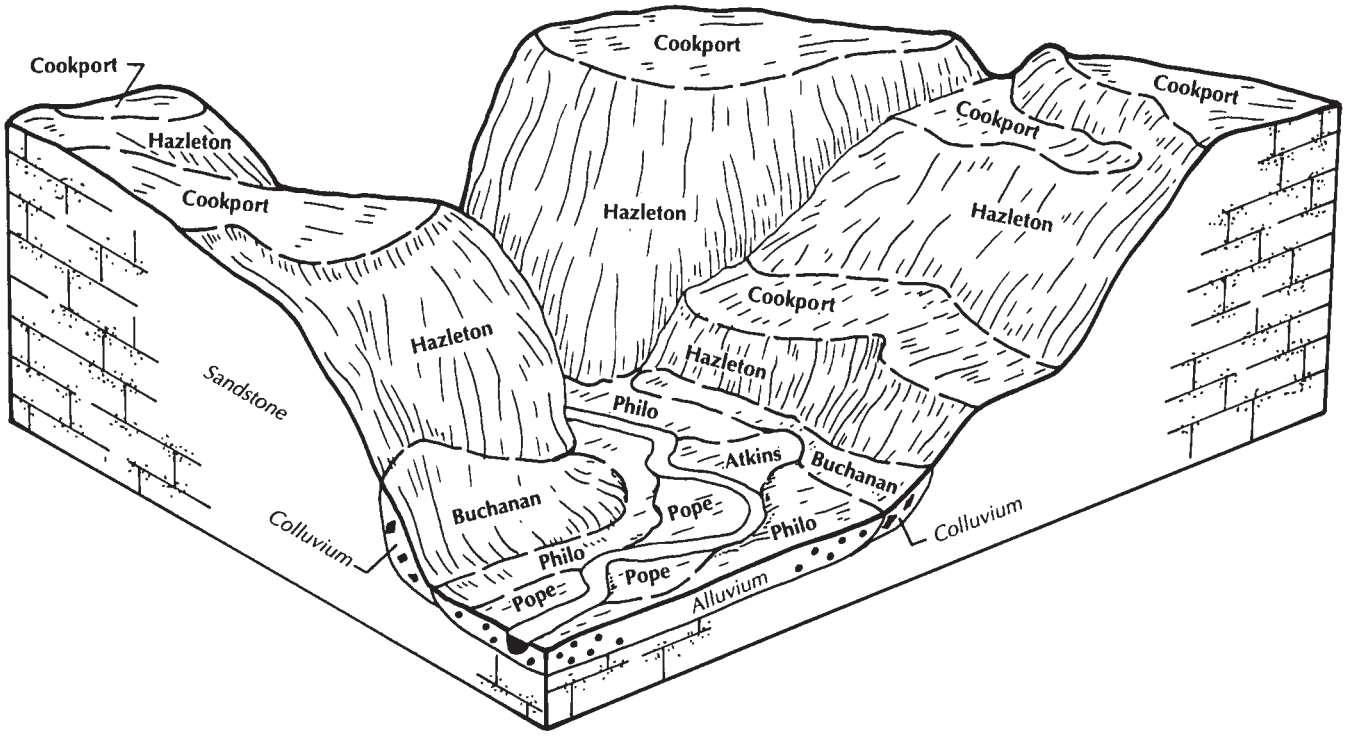

Figure 3.—Typical pattern of soils and underlying material in the Hazleton-Cookport-Buchanan association.

Figure 4.—An area of the Hartleton-Wharton-Buchanan association. Hartleton soils are in the wooded area in the background. Wharton soils are in the cultivated area in the middle. Buchanan soils are on the lower slopes around the buildings.

4. Leck Kill-Hartleton-Albrights Association

Very deep and deep, somewhat poorly drained to well drained, nearly level to very steep soils; formed in materials weathered from shale, sandstone, and siltstone; on uplands

This association makes up about 13 percent of the survey area. It is about 50 percent Leck Kill soils, 40 percent Hartleton soils, 4 percent Albrights soils, and 6 percent soils of minor extent (fig. 5).

Leck Kill soils are deep and well drained. They are underlain by red shale and siltstone bedrock at a depth of about 40 to 60 inches. These soils are gently sloping to very steep and generally are on hillsides.

Hartleton soils are deep and well drained. They are channery throughout and are underlain by brown siltstone and sandstone bedrock at a depth of 40 to 60 inches. These soils are gently sloping to very steep and generally are on hilltops and hillsides.

Albrights soils are very deep and are moderately well drained and somewhat poorly drained. They have a fragipan and a seasonal high water table. They are underlain by red sandstone and shale bedrock at a depth of more than 60 inches. These soils are nearly level to moderately steep and generally are on foot slopes.

The minor soils on uplands are the well drained Hazleton soils and the moderately well drained Cookport soils. The minor soils on flood plains are the moderately well drained Basher soils and the poorly drained Atkins soils.

Most areas of this association are used as woodland. Some areas that formerly were farmed are reverting to indigenous trees and shrubs. A few areas are used for urban or industrial development at Emporium.

This association has good potential for use as woodland and as habitat for wildlife. It has poor potential for farming and for urban uses. The major limitations affecting urban uses are the slope, stoniness, the seasonal high water table, and restricted permeability.

5. Hartleton-Wharton-Udorthents Association

Very deep and deep, moderately well drained and well drained, nearly level to very steep soils; formed in materials weathered from shale, sandstone, and siltstone; on uplands

This association is in an area extending from Brockport to Kersey and from Weedville to Benezette in Elk County. The association is on broad hilltops and hillsides.

This association makes up about 8 percent of the survey area. It is about 40 percent Hartleton soils, 25 percent Wharton soils, 19 percent Udorthents, and 16 percent soils of minor extent.

Hartleton soils are deep and well drained. They are channery throughout and are underlain by siltstone and sandstone bedrock at a depth of 40 to 60 inches. These soils are gently sloping to very steep and generally are on hilltops and hillsides.

Wharton soils are deep and moderately well drained. They have a seasonal high water table. They are underlain by siltstone and shale bedrock at a depth of about 40 to 60 inches. They are nearly level to moderately steep and generally are on broad hilltops.

Udorthents are very deep and are well drained and moderately well drained. They consist of highwalls and large spoil piles or backfilled material from surface coal mines. These soils are nearly level to very steep and generally are on hilltops and hillsides.

The minor soils on uplands are the somewhat poorly drained Cavode soils and the poorly drained Brinkerton soils. The minor soils on flood plains are the moderately well drained Philo soils and the poorly drained Atkins soils.

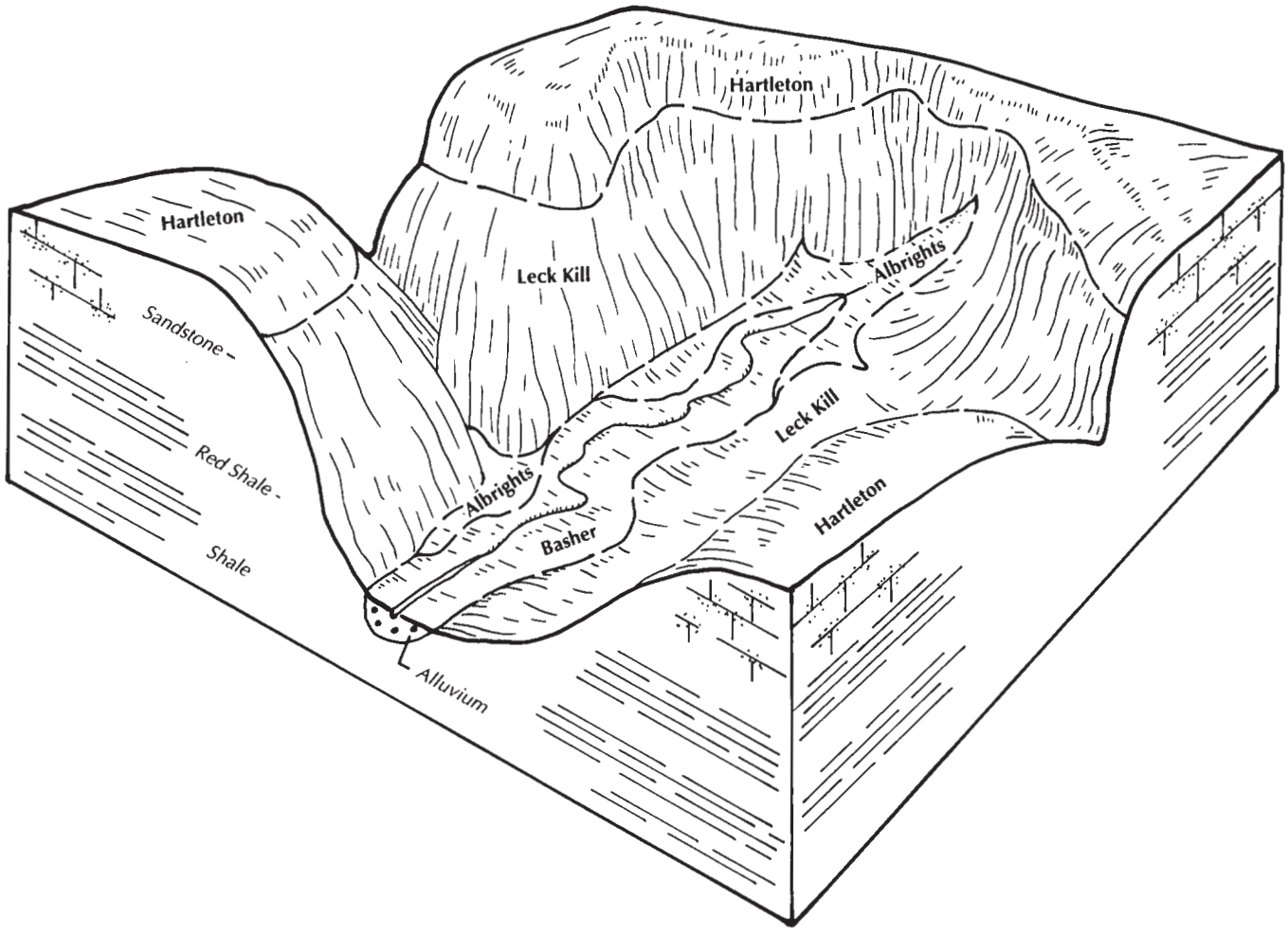

Figure 5.—Typical pattern of soils and underlying material in the Leck Kill-Hartleton-Albrights association.

Most areas of this association are used as woodland. A few areas are in farms. Some areas that formerly were farmed are reverting to indigenous shrubs and trees. A few areas are used for urban or industrial development at Brockport, Weedville, and Kersey.

This association has good potential for use as woodland and as habitat for wildlife. It has fair potential for farming and for urban uses. The major limitations affecting urban uses are the slope, restricted permeability, and the seasonal high water table.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Hartleton channery silt loam, 0 to 8 percent slopes, very stony, is a phase of the Hartleton series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Udifluvents-Buchanan complex is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Some of the boundaries on the detailed soil maps of Cameron and Elk Counties do not match those in earlier surveys. These discrepancies result from changes in the concepts of some series, differing soil patterns between adjacent counties, and differing degrees of soil separation.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The "Glossary" defines many of the terms used in describing the soils.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the

map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

Soil Descriptions

AbB—Albrights silt loam, 3 to 8 percent slopes. This is a gently sloping, very deep, moderately well drained and somewhat poorly drained soil on benches and at the head of drainageways. Slopes are smooth and concave and generally are 200 to 400 feet long. Areas generally are elongated or irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is dark reddish brown silt loam about 4 inches thick. The subsurface layer is reddish brown silt loam about 4 inches thick. The subsoil is about 32 inches thick. The upper part is reddish brown, mottled silt loam. The lower part, to a depth of about 40 inches, is a firm, brittle layer of reddish brown, mottled clay loam called a fragipan. The substratum is reddish brown, mottled channery clay loam to a depth of about 66 inches.

Included with this soil in mapping are small areas of the deep, well drained Leck Kill soils. Also included are some areas of very stony Albrights soils and areas of soils that are similar to the Albrights soil but are well drained. The included soils make up about 15 percent of this map unit.

Permeability is moderately slow in the fragipan of the Albrights soil. Available water capacity is moderate. Runoff is medium. The fragipan in the subsoil restricts the rooting depth to about 18 to 30 inches. The seasonal high water table is at a depth of about 6 to 36 inches. In unlimed areas the soil ranges from extremely acid to strongly acid in the upper part of the solum and is very strongly acid or strongly acid in the lower part and in the substratum. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. Some areas are used for cultivated crops or permanent hayland or are idle. A few areas are developed for nonfarm uses.

This soil is suited to cultivated crops. Conservation tillage, diversions, grassed waterways, cover crops, and contour stripcropping help to reduce the runoff rate and control erosion. In some areas installing surface and subsurface drainage systems will permit timely tillage.

This soil is suited to pasture. The major management concerns are overgrazing and grazing when the soil is wet. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. Building logging roads on the contour helps to control erosion. The seasonal high water table restricts the use of equipment. Machine planting is practical in the larger areas.

The limitations affecting onsite waste disposal and most other urban uses are the moderately slow permeability in the fragipan and the seasonal high water table. The seasonal high water table is a limitation on sites for dwellings with basements. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IIe; the woodland ordination symbol is 4A.

AbC—Albrights silt loam, 8 to 15 percent slopes. This is a sloping, very deep, moderately well drained and somewhat poorly drained soil on benches and at the head of drainageways. Slopes are smooth and concave and generally are 200 to 600 feet long. Areas generally are elongated or irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is dark reddish brown silt loam about 4 inches thick. The subsurface layer is reddish brown silt loam about 4 inches thick. The subsoil is about 32 inches thick. The upper part is reddish brown, mottled silt loam. The lower part, to a depth of about 40 inches, is a firm, brittle layer of reddish brown, mottled clay loam called a fragipan. The substratum is reddish brown, mottled channery clay loam to a depth of about 66 inches.

Included with this soil in mapping are small areas of the deep, well drained Leck Kill soils. Also included are

some areas of very stony Albrights soils and areas of soils that are similar to the Albrights soil but are well drained. The included soils make up about 20 percent of this map unit.

Permeability is moderately slow in the fragipan of the Albrights soil. Available water capacity is moderate. Runoff is medium. The fragipan in the subsoil restricts the rooting depth to about 18 to 30 inches. The seasonal high water table is at a depth of about 6 to 36 inches. In unlimed areas the soil ranges from extremely acid to strongly acid in the upper part of the solum and is very strongly acid or strongly acid in the lower part and in the substratum. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. Some areas are used for cultivated crops or permanent hayland or are idle. A few areas are developed for nonfarm uses.

This soil is suited to cultivated crops. Conservation tillage, diversions, grassed waterways, cover crops, and contour stripcropping help to reduce the runoff rate and control erosion. In some areas installing surface and subsurface drainage systems will permit timely tillage.

This soil is suited to pasture. The major management concerns are overgrazing and grazing when the soil is wet. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. Building logging roads on the contour helps to control erosion. The seasonal high water table restricts the use of equipment. Machine planting is practical in the larger areas.

The limitations affecting onsite waste disposal and most other urban uses are the moderately slow permeability in the fragipan and the seasonal high water table. The seasonal high water table is a limitation on sites for dwellings with basements. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IIIe; the woodland ordination symbol is 4A.

AbD—Albrights silt loam, 15 to 25 percent slopes. This is a moderately steep, very deep, moderately well drained and somewhat poorly drained soil on the lower hillsides. Slopes are smooth and concave and generally are 200 to 600 feet long. Areas generally are elongated and range from 5 to 25 acres in size.

Typically, the surface layer is dark reddish brown silt loam about 4 inches thick. The subsurface layer is reddish brown silt loam about 4 inches thick. The subsoil is about 32 inches thick. The upper part is reddish brown, mottled silt loam. The lower part, to a depth of about 40 inches, is a firm, brittle layer of reddish brown, mottled clay loam called a fragipan. The substratum is reddish brown, mottled channery loam to a depth of about 66 inches.

Included with this soil in mapping are small areas of the deep, well drained Leck Kill soils. Also included are some areas of very stony Albrights soils and areas of soils that are similar to the Albrights soil but are well drained. The included soils make up about 20 percent of this map unit.

Permeability is moderately slow in the fragipan of the Albrights soil. Available water capacity is moderate. Runoff is rapid. The fragipan in the subsoil restricts the rooting depth to about 18 to 30 inches. The seasonal high water table is at a depth of about 6 to 36 inches. In unlimed areas the soil ranges from extremely acid to strongly acid in the upper part of the solum and is very strongly acid or strongly acid in the lower part and in the substratum. Erosion is a severe hazard.

Most areas of this soil are used as woodland. Some areas are used as permanent hayland or are idle. A few areas are developed for nonfarm uses.

This soil is suited to cultivated crops. Erosion is a severe hazard. Conservation tillage, diversions, grassed waterways, cover crops, and contour stripcropping help to reduce the runoff rate and control erosion.

This soil is suited to pasture. The major management concerns are overgrazing and grazing when the soil is wet. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The slope and the seasonal high water table limit the use of equipment. Machine planting is practical in the larger areas.

The limitations affecting onsite waste disposal and most other urban uses are the moderately slow permeability in the fragipan, the seasonal high water table, and the slope. The seasonal high water table and the slope are limitations on sites for dwellings with basements. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IVe; the woodland ordination symbol is 4R.

At—Atkins silt loam. This is a nearly level, very deep, poorly drained soil on the first bottoms of flood plains. Slopes are smooth and concave and are about 200 to 300 feet long. They range from 0 to 3 percent. Areas generally are oblong or oval and range from 8 to 40 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is gray, mottled silt loam about 5 inches thick. The subsoil also is gray, mottled silt loam. It is about 27 inches thick. The substratum is gray, mottled channery loam to a depth of about 64 inches.

Included with this soil in mapping are some small areas of soils that are similar to the Atkins soil but are very poorly drained. Also included are small areas of the very deep, moderately well drained Basher and Philo soils. The included soils make up about 15 percent of this map unit.

Permeability is slow in the subsoil of the Atkins soil. Available water capacity is high. The seasonal high water table is within 12 inches of the surface. Runoff is very slow. This soil is subject to frequent flooding. The seasonal high water table restricts the rooting depth. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a slight hazard.

Most areas of this soil are idle or are used as woodland.

If drained, this soil is suited to cultivated crops. Flooding frequently delays planting, however, and sometimes damages crops. Excess water causes the soil to warm slowly. It also interferes with harvesting. Installing surface and subsurface drains will drain the excess water.

This soil is suited to pasture. The main management concerns are overgrazing and grazing when the soil is too wet. Installing surface and subsurface drains will remove excess water. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for red maple is moderate. The seasonal high water table restricts the use of equipment during wet periods. It also restricts root growth. The windthrow hazard is a major management concern. Restricting logging activities during wet periods helps to control erosion. Where feasible, building the main haul roads on better drained soils allows for the timely use of equipment.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the flooding.

The capability subclass is IIIw; the woodland ordination symbol is 4W.

Ba—Barbour fine sandy loam. This is a nearly level, very deep, well drained soil on flood plains. Slopes are smooth and slightly convex and are about 150 to 400 feet long. They range from 0 to 3 percent. Areas generally are long and narrow and range from 5 to 40 acres in size.

Typically, the surface layer is dark brown fine sandy loam about 7 inches thick. The subsoil, to a depth of about 30 inches, is brown fine sandy loam. The substratum is reddish brown very channery loamy sand to a depth of about 66 inches.

Included with this soil in mapping are small areas of the very deep, moderately well drained Basher soils and the very deep, poorly drained Atkins soils. Also included are some small areas of soils that are similar to the Barbour soil but are on low terraces. The included soils make up about 15 percent of this map unit.

Permeability is moderately rapid in the subsoil of the Barbour soil. Available water capacity is high. Runoff is slow. This soil is subject to rare flooding. In unlimed areas it ranges from medium acid to very strongly acid. Erosion is a slight hazard.

Most areas of this soil are used as woodland. Some areas are used for cultivated crops or pasture. A few areas are developed for urban or other nonfarm uses.

This soil is suited to cultivated crops. Flooding is a hazard. In some years it delays planting and harvesting. Growing cover crops, adding crop residue to the soil, and including hay in the cropping system help to maintain the organic matter content and good tilth and reduce the hazard of scouring by floodwater.

This soil is suited to pasture. Overgrazing is the major management concern. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing help to keep the soil and pasture in good condition. Applying plant nutrients and maintaining fertility increase forage yields.

This soil is suited to trees. The potential productivity for sugar maple is moderate. Few problems affect woodland management. In some years flooding limits the use of equipment for short periods. Removing undesirable trees will increase timber production. Machine planting generally is practical.

Flooding is a hazard on sites for dwellings with basements and for most other urban uses. Because of its permeability, the soil is a poor filter of effluent. The flooding and the poor filtering capacity are limitations affecting onsite waste disposal. If the soil is used for onsite waste disposal, ground water contamination is a hazard.

The capability class is I; the woodland ordination symbol is 3A.

Bb—Basher silt loam. This is a nearly level, very deep, moderately well drained soil on flood plains. Slopes are about 200 to 400 feet long. They range from 0 to 3 percent. Areas generally are long and narrow and range from 5 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of about 30 inches. The upper part is reddish brown silt loam to a depth of about 15 inches. The lower part is reddish brown, mottled fine sandy loam to a depth of about 30 inches. The upper part of the substratum is grayish brown, mottled fine sandy loam to a depth of about 42 inches. The lower part is light gray, mottled gravelly loamy sand to a depth of about 66 inches.

Included with this soil in mapping are some small areas of the very deep, poorly drained Atkins soils and the very deep, well drained Barbour soils. The included soils make up about 15 percent of this map unit.

Permeability is moderate or moderately slow in the subsoil of the Basher soil. Available water capacity is high. Runoff is slow. The seasonal high water table is at a depth of 6 to 24 inches during wet periods. This soil is subject to occasional flooding of brief duration. In unlimed areas it is strongly acid or very strongly acid. Erosion is a slight hazard.

Most areas of this soil are used for cultivated crops, hay, or pasture. Some areas are wooded.

This soil is suited to cultivated crops. Flooding is a hazard. In some years it delays planting and harvesting. Cover crops, crop residue management, and a cropping system that includes grasses and legumes help to maintain the organic matter content and good tilth and reduce the hazard of scouring by floodwater.

This soil is suited to pasture. Overgrazing and grazing when the soil is too wet are the major management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for sugar maple is moderate. Removing undesirable trees helps to increase timber production. Flooding limits the use of equipment for short periods. Machine planting generally is practical.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the flooding and the seasonal high water table.

The capability subclass is IIw; the woodland ordination symbol is 3A.

BrA—Brinkerton silt loam, 0 to 3 percent slopes. This is a nearly level, very deep, poorly drained soil in drainageways, near the head of streams, and in broad upland basins. Slopes are uniform and concave and are about 200 to 500 feet long. Areas are irregular in shape or oblong and range from 5 to 30 acres in size.

Typically, the surface layer is very dark gray silt loam about 6 inches thick. The subsoil extends to a depth of about 50 inches. The upper part is light brownish gray, mottled silty clay loam to a depth of about 24 inches. The lower part is grayish brown, mottled, firm channery silt loam to a depth of about 50 inches. The substratum is grayish brown, mottled silt loam to a depth of about 96 inches.

Included with this soil in mapping are some small areas of the very deep, moderately well drained Buchanan soils, the deep, poorly drained Cavode soils, and the very deep, moderately well drained Philo soils. The included soils make up about 10 to 15 percent of this map unit.

Permeability is slow in the fragipan of the Brinkerton soil. Available water capacity is moderate. Runoff is slow, and water ponds on the surface during wet periods. The fragipan in the subsoil is at a depth of 15 to 30 inches. The seasonal high water table is within 6 inches of the surface during wet periods. The water table and the fragipan both restrict the rooting depth. In unlimed areas the soil is strongly acid or very strongly acid in the surface layer and subsoil and strongly acid or medium acid in the substratum. Erosion is a slight hazard.

Most areas of this soil are used as woodland. Some areas are used as pasture.

This soil is suited to cultivated crops. The main limitation is the seasonal high water table. Excess water causes the soil to warm slowly in spring and delays planting. In some years ponding damages crops. Surface and subsurface drains will drain the soil and thus will permit timely tillage. Growing cover crops and including grasses in the cropping system help to maintain fertility and the organic matter content.

This soil is suited to pasture. Grazing when the soil is too wet causes surface compaction. It is a major management concern. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition. Installing surface and subsurface drains will improve drainage.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table and the fragipan restrict the rooting depth. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment for long periods. Machine planting generally is practical.

The limitations affecting onsite waste disposal,

dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability in the fragipan and substratum. The better drained adjacent soils are better suited to onsite waste disposal systems. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IVw; the woodland ordination symbol is 4W.

BrB—Brinkerton silt loam, 3 to 8 percent slopes. This is a gently sloping, very deep, poorly drained soil in drainageways and at the head of streams. Slopes are uniform and concave and are about 100 to 300 feet long. Areas are oblong or irregular in shape and range from 5 to 25 acres in size.

Typically, the surface layer is very dark gray silt loam about 6 inches thick. The subsoil extends to a depth of about 50 inches. The upper part is light brownish gray, mottled silty clay loam to a depth of about 24 inches. The lower part is grayish brown, mottled, firm channery silt loam to a depth of about 50 inches. The substratum is grayish brown, mottled silt loam to a depth of about 96 inches.

Included with this soil in mapping are some small areas of the very deep, moderately well drained Buchanan soils, the deep, poorly drained Cavode soils, and the very deep, moderately well drained Philo soils. The included soils make up about 10 to 15 percent of this map unit.

Permeability is slow in the fragipan of the Brinkerton soil. Available water capacity is moderate. Runoff is slow, and water ponds on the surface during wet periods. The fragipan in the subsoil is at a depth of 15 to 30 inches. The seasonal high water table is within 6 inches of the surface during wet periods. The water table and the fragipan both restrict the rooting depth. In unlimed areas the soil is strongly acid or very strongly acid in the surface layer and subsoil and is strongly acid or medium acid in the substratum. Erosion is a slight hazard.

Most areas of this soil are used as woodland. Some areas are used as pasture.

This soil is suited to cultivated crops. The main limitation is the seasonal high water table. Stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce the runoff rate and control erosion. Excess water causes the soil to warm slowly in spring and delays planting. In some years ponding damages crops. Installing surface and subsurface drains will lower the water table and thus will permit timely tillage.

This soil is suited to pasture. Grazing when the soil is too wet compacts the surface. It is a major management concern. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition. Installing surface and subsurface drains will improve drainage.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table and the fragipan restrict the rooting depth. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment for long periods. Machine planting generally is practical.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability in the fragipan and substratum. The better drained adjacent soils are better suited to onsite waste disposal systems. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IVw; the woodland ordination symbol is 4W.

BsB—Brinkerton silt loam, 0 to 8 percent slopes, very stony. This is a nearly level and gently sloping, very deep, poorly drained soil in drainageways and in broad upland basins. Slopes are uniform and concave and are about 200 to 500 feet long. Areas are irregular in shape or oblong and range from 5 to 50 acres in size. Stones 1 to 2 feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark gray silt loam about 6 inches thick. The subsoil extends to a depth of about 50 inches. The upper part is light brownish gray, mottled silty clay loam to a depth of about 24 inches. The lower part is grayish brown, mottled, firm channery silt loam to a depth of about 50 inches. The substratum is grayish brown, mottled silt loam to a depth of about 96 inches.

Included with this soil in mapping are some small areas of the very deep, moderately well drained Buchanan soils, the deep, poorly drained Cavode soils, and the very deep, moderately well drained Philo soils. The included soils make up about 10 to 15 percent of this map unit.

Permeability is slow in the fragipan of the Brinkerton soil. Available water capacity is moderate. Runoff is slow, and water ponds on the surface during wet periods. The fragipan in the subsoil is at a depth of 15 to 30 inches. The seasonal high water table is within 6 inches of the surface during wet periods. The water table and the fragipan restrict the rooting depth. In unlimed areas the soil is strongly acid or very strongly acid in the surface layer and subsoil and strongly acid

or medium acid in the substratum. Erosion is a slight hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table and the fragipan restrict the rooting depth. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment for long periods. The surface stones also restrict the use of equipment.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability in the fragipan and substratum. The better drained adjacent soils are better suited to onsite waste disposal systems. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is VIs; the woodland ordination symbol is 4W.

BuB—Buchanan silt loam, 3 to 8 percent slopes. This is a gently sloping, very deep, moderately well drained soil on foot slopes and along drainageways. Slopes are concave and generally are 200 to 400 feet long. Areas generally are rectangular or irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsurface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 40 inches. The upper part is yellowish brown silt loam to a depth of about 17 inches. The next part is yellowish brown, mottled silt loam to a depth of about 25 inches. The lower part, to a depth of about 40 inches, is a firm, brittle layer of brown, mottled channery loam called a fragipan. The substratum is brown, mottled channery loam to a depth of about 66 inches.

Included with this soil in mapping are some small areas of the deep, moderately well drained Wharton soils and the deep, somewhat poorly drained Cavode soils. Also included are areas of soils that are similar to the Buchanan soil but are finer textured in the subsoil. The included soils make up as much as 10 percent of this map unit.

Permeability is slow in the fragipan of the Buchanan soil. Available water capacity is moderate. Runoff is medium. The fragipan in the subsoil restricts the rooting depth to about 20 to 30 inches. During wet periods the seasonal high water table is at a depth of 18 to 30 inches. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. Some areas are used for cultivated crops. A few areas are developed for nonfarm uses.

This soil is suited to cultivated crops. Erosion is a moderate hazard. Conservation tillage, contour stripcropping, cover crops, diversions, and a cropping system that includes grasses and legumes help to reduce the runoff rate and control erosion. Installing surface and subsurface drains will remove excess water and thus will allow for timely tillage.

This soil is suited to pasture (fig. 6). Overgrazing and grazing when the soil is too wet will compact the surface. They are the major management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment during wet periods. Machine planting generally is practical.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the slow permeability in the fragipan and substratum and the seasonal high water table. Foundation drains with proper outlets help to reduce wetness around basements.

The capability subclass is IIe; the woodland ordination symbol is 4A.

BuC—Buchanan silt loam, 8 to 15 percent slopes. This is a sloping, very deep, moderately well drained soil on foot slopes and near the head of drainageways. Slopes are concave and generally are 200 to 600 feet long. Areas generally are rectangular or irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsurface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 40 inches. The upper part, to a depth of about 17 inches, is yellowish brown silt loam. The next part, to a depth of about 25 inches, is yellowish brown, mottled silt loam. The lower part, to a depth of about 40 inches, is a firm, brittle layer of brown, mottled channery loam called a fragipan. The substratum is brown, mottled channery loam to a depth of about 66 inches.

Included with this soil in mapping are some small areas of the deep, moderately well drained Wharton soils and the deep, somewhat poorly drained Cavode soils. Also included are areas of soils that are similar to

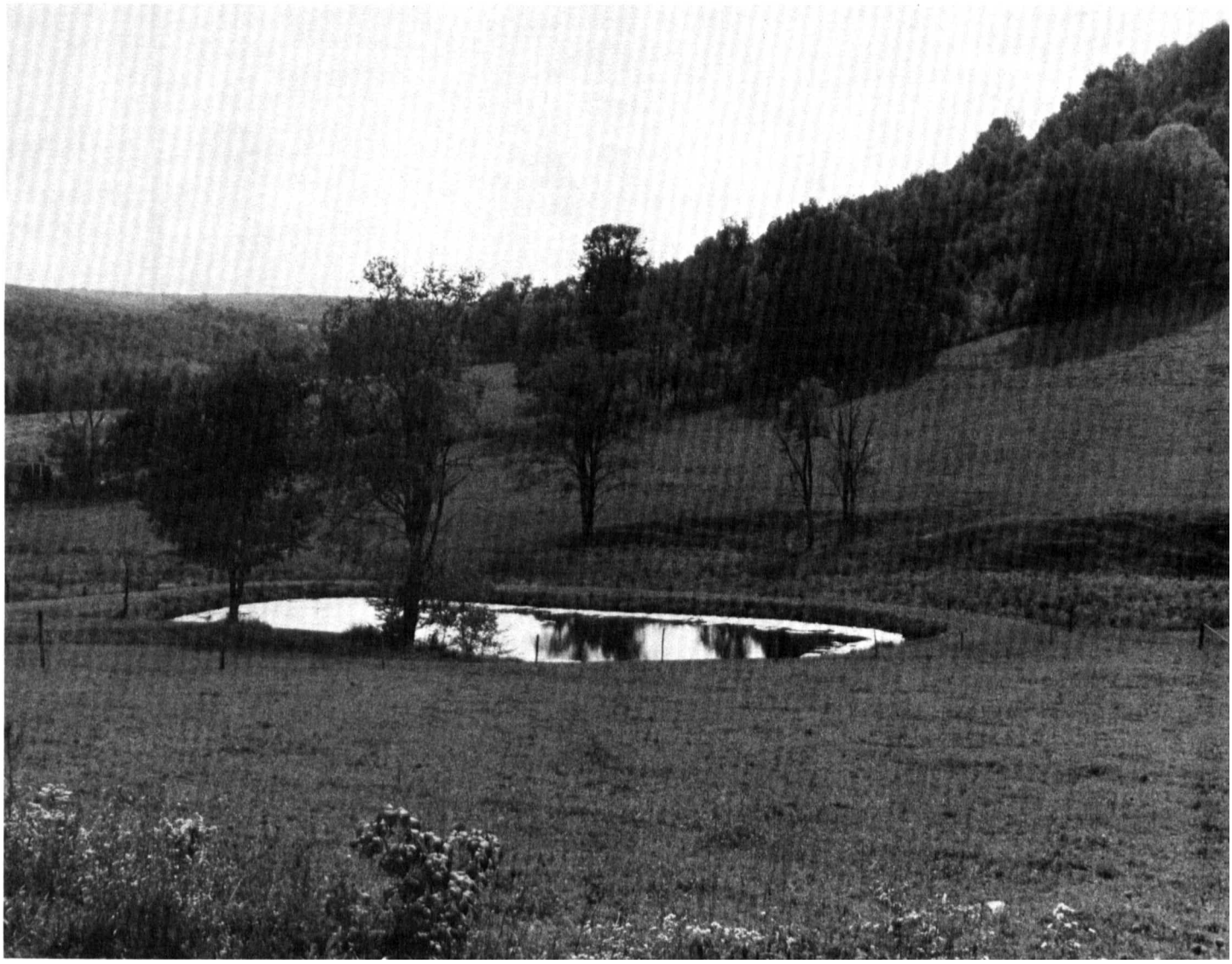

Figure 6.—A farm pond in a pastured area of Buchanan silt loam, 3 to 8 percent slopes.

the Buchanan soil but are finer textured in the subsoil. The included soils make up as much as 15 percent of this map unit.

Permeability is slow in the fragipan of the Buchanan soil. Available water capacity is moderate. Runoff is medium. The fragipan in the subsoil restricts the rooting depth to about 20 to 30 inches. During wet periods the seasonal high water table is at a depth of 18 to 30 inches. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. Some areas are used for cultivated crops. A few areas are developed for nonfarm uses.

This soil is suited to cultivated crops. Erosion is a moderate hazard. Conservation tillage, contour stripcropping, cover crops, diversions, and a cropping system that includes grasses and legumes help to reduce the runoff rate and control erosion. Installing surface and subsurface drains will remove excess water and thus will allow for timely tillage.

This soil is suited to pasture. Overgrazing and grazing when the soil is too wet will compact the surface. They are the major management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment during wet periods. Machine planting generally is practical.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the slow permeability in the fragipan and substratum and the seasonal high water table. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IIIe; the woodland ordination symbol is 4A.

BuD—Buchanan silt loam, 15 to 25 percent slopes. This is a moderately steep, very deep, moderately well drained soil on foot slopes and the lower hillsides. Slopes are concave and generally are 200 to 400 feet long. Areas generally are rectangular or irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsurface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 40 inches. The upper part, to a depth of about 17 inches, is yellowish brown silt loam. The next part, to a depth of about 25 inches, is yellowish brown, mottled silt loam. The lower part, to a depth of about 40 inches, is a firm, brittle layer of brown, mottled channery loam called a fragipan. The substratum is brown, mottled channery loam to a depth of about 66 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hartleton and Hazleton soils and the deep, moderately well drained Wharton soils. Also included are areas of soils that are similar to the Buchanan soil but are finer textured in the subsoil. The included soils make up as much as 20 percent of this map unit.

Permeability is slow in the fragipan of the Buchanan soil. Available water capacity is moderate. Runoff is rapid. The fragipan in the subsoil restricts the rooting depth to about 20 to 30 inches. During wet periods the seasonal high water table is at a depth of 18 to 30 inches. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a severe hazard.

Most areas of this soil are used as woodland. Some areas are used for cultivated crops. A few areas are developed for nonfarm uses.

This soil is suited to cultivated crops. Erosion is a severe hazard. Conservation tillage, contour stripcropping, cover crops, diversions, and a cropping system that includes grasses and legumes help to reduce the runoff rate and control erosion.

This soil is suited to pasture. Overgrazing and grazing when the soil is too wet will compact the surface. They are the major management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The slope restricts the use of equipment. The seasonal high water table also restricts the use of equipment during wet periods. Machine planting generally is practical.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the slow permeability in the fragipan and substratum, the seasonal high water table, and the slope. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IVe; the woodland ordination symbol is 4R.

BxB—Buchanan silt loam, 0 to 8 percent slopes, very stony. This is a nearly level and gently sloping, very deep, moderately well drained soil on foot slopes and along drainageways. Slopes are concave and generally are 200 to 400 feet long. Areas generally are rectangular or irregular in shape and range from 5 to 40 acres in size. Stones about 1 to 3 feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsurface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 40 inches. The upper part, to a depth of about 17 inches, is yellowish brown silt loam. The next part, to a depth of about 25 inches, is yellowish brown, mottled silt loam. The lower part, to a depth of about 40 inches, is a firm, brittle layer of brown, mottled channery loam called a fragipan. The substratum is brown, mottled channery loam to a depth of about 66 inches.

Included with this soil in mapping are some small areas of the deep, moderately well drained Wharton soils and the deep, somewhat poorly drained Cavode soils. Also included are areas of soils that are similar to the Buchanan soil but are finer textured in the subsoil. The included soils make up as much as 15 percent of this map unit.

Permeability is slow in the fragipan of the Buchanan soil. Available water capacity is moderate. Runoff is medium. The fragipan in the subsoil restricts the rooting depth to about 20 to 30 inches. During wet periods the

seasonal high water table is at a depth of 18 to 30 inches. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a moderate hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment during wet periods. In some areas the surface stones also restrict the use of equipment.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the slow permeability in the fragipan and substratum and the seasonal high water table. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is VIs; the woodland ordination symbol is 4A.

BxD—Buchanan silt loam, 8 to 25 percent slopes, very stony. This is a sloping and moderately steep, very deep, moderately well drained soil on foot slopes, on the lower hillsides, and along drainageways. Slopes are concave and generally are 200 to 400 feet long. Areas generally are irregular in shape or rectangular and range from 10 to 60 acres in size. Numerous stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsurface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 40 inches. The upper part, to a depth of about 17 inches, is yellowish brown silt loam. The next part, to a depth of about 25 inches, is yellowish brown, mottled silt loam. The lower part, to a depth of about 40 inches, is a firm, brittle layer of brown, mottled channery loam called a fragipan. The substratum is brown, mottled channery loam to a depth of about 66 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hartleton and Hazleton soils, the deep, moderately well drained Wharton soils, and the deep, somewhat poorly drained Cavode soils. Also included are areas of soils that are similar to the Buchanan soil but are finer textured in the subsoil. The included soils make up as much as 20 percent of this map unit.

Permeability is slow in the fragipan of the Buchanan soil. Available water capacity is moderate. Runoff is medium or rapid. The fragipan in the subsoil restricts the rooting depth to about 20 to 30 inches. During wet periods the seasonal high water table is at a depth of 18 to 30 inches. In unlimed areas the soil is strongly acid or very strongly acid. The hazard of erosion is severe or very severe.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment during wet periods. In some areas the surface stones also restrict the use of equipment.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the slow permeability in the fragipan and substratum and the seasonal high water table. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is VIs; the woodland ordination symbol is 4R.

CaA—Cavode silt loam, 0 to 3 percent slopes. This is a nearly level, deep, somewhat poorly drained soil on broad hilltops. Slopes are concave and are about 200 to 300 feet long. Areas are oblong or irregular in shape and range from 4 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of about 44 inches. The upper 18 inches is yellowish brown, mottled silty clay loam. The lower 18 inches is grayish brown, mottled channery silty clay loam. The substratum is grayish brown, mottled channery silty clay loam to a depth of about 58 inches.

Included with this soil in mapping are some areas of the deep, moderately well drained Wharton soils and the very deep, moderately well drained Buchanan soils. The included soils make up as much as 15 percent of this map unit.

Permeability is slow in the subsoil of the Cavode soil. Available water capacity is moderate. Runoff is slow. The seasonal high water table restricts the rooting depth to about 6 to 18 inches. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a slight hazard.

Most areas of this soil are used as woodland. A few areas are used for pasture or cultivated crops.

This soil is suited to cultivated crops. The seasonal high water table causes the soil to warm slowly in spring. Installing surface and subsurface drains will improve drainage. Growing cover crops and mixing crop residue into the surface layer help to maintain the organic matter content and good tilth.

This soil is suited to pasture. Overgrazing and grazing when the soil is too wet will compact the surface. They are the main management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition. Installing surface and subsurface drains helps to improve drainage.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table restricts the rooting depth. It also restricts the use of equipment during wet periods. Machine planting generally is practical. Removing undesirable trees helps to increase timber production.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability. Specially designed systems of onsite waste disposal will work on this soil. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IIIw; the woodland ordination symbol is 4W.

CaB—Cavode silt loam, 3 to 8 percent slopes. This is a gently sloping, deep, somewhat poorly drained soil on broad hilltops and benches. Slopes are concave and are about 200 to 300 feet long. Areas are oblong or irregular in shape and range from 4 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of about 44 inches. The upper 18 inches is yellowish brown, mottled silty clay loam. The lower 18 inches is grayish brown, mottled channery silty clay loam. The substratum is grayish brown, mottled channery silty clay loam to a depth of about 58 inches.

Included with this soil in mapping are some areas of the deep, moderately well drained Wharton soils and the very deep, moderately well drained Buchanan soils. The included soils make up as much as 15 percent of this map unit.

Permeability is slow in the subsoil of the Cavode soil. Available water capacity is moderate. Runoff is medium. The seasonal high water table restricts the rooting depth to about 6 to 18 inches. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. A few areas are used for pasture or cultivated crops.

This soil is suited to cultivated crops. The seasonal high water table causes the soil to warm slowly in spring. Conservation tillage, contour stripcropping, diversions, cover crops, and a cropping system that includes grasses and legumes help to reduce the runoff rate and control erosion. Surface and subsurface drains help to improve drainage. Mixing crop residue and manure into the surface layer helps to maintain the organic matter content and good tilth.

This soil is suited to pasture. Overgrazing and grazing when the soil is too wet will compact the surface. They are the main management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition. Installing surface and subsurface drains helps to improve drainage.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table restricts the rooting depth. It also limits the use of equipment during wet periods. Machine planting generally is practical. Removing undesirable trees helps to increase timber production.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability. Specially designed systems of onsite waste disposal will work on this soil. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IIIw; the woodland ordination symbol is 4W.

CaC—Cavode silt loam, 8 to 15 percent slopes. This is a sloping, deep, somewhat poorly drained soil on side slopes. Slopes are concave and are about 200 to 300 feet long. Areas are irregular in shape and range from 4 to 60 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of about 44 inches. The upper 18 inches is yellowish brown, mottled silty clay loam. The lower 18 inches is grayish brown, mottled channery silty clay loam. The substratum is grayish brown, mottled channery silty clay loam to a depth of about 58 inches.

Included with this soil in mapping are some areas of the deep, moderately well drained Wharton soils and the very deep, moderately well drained Buchanan soils. The included soils make up as much as 20 percent of this map unit.

Permeability is slow in the subsoil of the Cavode soil. Available water capacity is moderate. Runoff is medium. The seasonal high water table restricts the rooting depth to about 6 to 18 inches. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. A few

areas are used for pasture or cultivated crops.

This soil is suited to cultivated crops. The seasonal high water table causes the soil to warm slowly in spring. Conservation tillage, contour stripcropping, diversions, cover crops, and a cropping system that includes grasses and legumes help to reduce the runoff rate and control erosion. Installing surface and subsurface drains will improve drainage. Mixing crop residue and manure into the surface layer helps to maintain the organic matter content and good tilth.

This soil is suited to pasture. Overgrazing and grazing when the soil is too wet will compact the surface. They are the main management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition. Installing surface and subsurface drains will improve drainage.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table restricts the rooting depth. It also restricts the use of equipment during wet periods. Machine planting generally is practical. Removing undesirable trees helps to increase timber production.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability. Specially designed systems of onsite waste disposal will work on this soil. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IIIe; the woodland ordination symbol is 4W.

CdB—Cavode silt loam, 0 to 8 percent slopes, very stony. This is a nearly level and gently sloping, deep, somewhat poorly drained soil on broad hilltops and benches. Slopes are concave and are about 200 to 300 feet long. Areas are oblong or irregular in shape and range from 4 to 40 acres in size. Stones about 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of about 44 inches. The upper 18 inches is yellowish brown, mottled silty clay loam. The lower 18 inches is grayish brown, mottled channery silty clay loam. The substratum is grayish brown, mottled channery silty clay loam to a depth of about 58 inches.

Included with this soil in mapping are some areas of the deep, moderately well drained Wharton soils and the very deep, moderately well drained Buchanan soils. The included soils make up as much as 15 percent of this map unit.

Permeability is slow in the subsoil of the Cavode soil. Available water capacity is moderate. Runoff is medium. The seasonal high water table restricts the rooting depth to about 6 to 18 inches. In unlimed areas the soil is strongly acid or very strongly acid. The hazard of erosion is slight or moderate.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table restricts the rooting depth. It restricts the use of equipment during wet periods. The surface stones also restrict the use of equipment. Removing undesirable trees helps to increase timber production.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability. Specially designed systems of onsite waste disposal will work on this soil. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is VIs; the woodland ordination symbol is 4W.

CdD—Cavode silt loam, 8 to 25 percent slopes, very stony. This is a sloping and moderately steep, deep, somewhat poorly drained soil on hillsides. Slopes are concave and are about 200 to 300 feet long. Areas are oblong or irregular in shape and range from 4 to 60 acres in size. Numerous stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of about 44 inches. The upper 18 inches is yellowish brown, mottled silty clay loam. The lower 18 inches is grayish brown, mottled channery silty clay loam. The substratum is grayish brown, mottled channery silty clay loam to a depth of about 58 inches.

Included with this soil in mapping are some areas of the deep, moderately well drained Wharton soils and the very deep, moderately well drained Buchanan soils. The included soils make up as much as 20 percent of this map unit.

Permeability is slow in the subsoil of the Cavode soil. Available water capacity is moderate. Runoff is medium or rapid. The seasonal high water table restricts the rooting depth to about 6 to 18 inches. In unlimed areas the soil is strongly acid or very strongly acid. The hazard of erosion is slight or moderate.

Most areas are used as woodland. This soil is

unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table and, in some areas, the slope restrict the rooting depth. The water table restricts the use of equipment during wet periods. Machine planting generally is practical. Removing undesirable trees helps to increase timber production.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability. Specially designed systems of onsite waste disposal will work on this soil. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is VIs; the woodland ordination symbol is 4W.

CoA—Cookport channery loam, 0 to 3 percent slopes. This is a nearly level, deep, moderately well drained soil on broad hilltops. Slopes are concave and generally are 200 to 300 feet long. Areas generally are oblong or irregular in shape and range from 5 to 25 acres in size.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 6 inches thick. The subsoil extends to a depth of about 40 inches. It is mottled below a depth of 16 inches. The upper 15 inches is yellowish brown channery loam. The lower 17 inches is a firm, brittle layer of yellowish brown sandy clay loam called a fragipan. The substratum is yellowish brown, mottled channery sandy clay loam to a depth of about 46 inches. Sandstone bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hazleton soils, the deep, poorly drained Nolo soils, and the very deep, moderately well drained Buchanan soils. Also included are some small areas of somewhat poorly drained soils that are similar to the Cookport soil. The included soils make up as much as 15 percent of this map unit.

Permeability is slow in the fragipan of the Cookport soil. Available water capacity is low or moderate. Runoff is slow. The fragipan in the subsoil restricts the rooting depth to about 16 to 27 inches. The seasonal high water table is at a depth of 12 to 30 inches. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a slight hazard.

Most areas of this soil are used as woodland. A few areas are used for cultivated crops or pasture.

This soil is suited to cultivated crops. In some years the seasonal high water table and ponding delay planting or damage crops. Conservation tillage, cover crops, and a cropping system that includes grasses and legumes help to reduce the runoff rate and control erosion. Installing surface and subsurface drains will remove excess water and thus will allow for timely tillage.

This soil is suited to pasture. Overgrazing and grazing when the soil is too wet compact the surface. They are the main management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment. Machine planting generally is practical.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability in the fragipan. Specially designed systems of onsite waste disposal will work on this soil. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IIw; the woodland ordination symbol is 4W.

CoB—Cookport channery loam, 3 to 8 percent slopes. This is a gently sloping, deep, moderately well drained soil on broad hilltops and benches. Slopes are concave and generally are 200 to 300 feet long. Areas generally are oblong or irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 6 inches thick. The subsoil extends to a depth of about 40 inches. It is mottled below a depth of 16 inches. The upper 15 inches is yellowish brown channery loam. The lower 17 inches is a firm, brittle layer of yellowish brown sandy clay loam called a fragipan. The substratum is yellowish brown, mottled channery sandy clay loam to a depth of about 46 inches. Sandstone bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hazleton soils, the deep, poorly drained Nolo soils, and the very deep, moderately well drained Buchanan soils. Also included are some small areas of somewhat poorly drained soils that are similar to the Cookport soil. The included soils make up as much as 15 percent of this map unit.

Permeability is slow in the fragipan of the Cookport soil. Available water capacity is low or moderate. Runoff is medium. The fragipan in the subsoil restricts the rooting depth to about 16 to 27 inches. The seasonal high water table is at a depth of 12 to 30 inches. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. A few areas are used for cultivated crops or pasture.

This soil is suited to cultivated crops. In some years the seasonal high water table and ponding delay planting or damage crops. Conservation tillage, contour stripcropping, diversions, cover crops, and a cropping system that includes grasses and legumes help to reduce the runoff rate and control erosion. Surface and subsurface drains help to remove excess water and thus allow for timely tillage.

This soil is suited to pasture. Overgrazing and grazing when the soil is too wet compact the surface. They are the main management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment. Machine planting generally is practical.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability in the fragipan. Specially designed systems of onsite waste disposal are needed. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IIe; the woodland ordination symbol is 4W.

CoC—Cookport channery loam, 8 to 15 percent slopes. This is a sloping, deep, moderately well drained soil on side slopes. Slopes are concave and generally are 200 to 300 feet long. Areas generally are oblong or irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 6 inches thick. The subsoil extends to a depth of about 40 inches. It is mottled below a depth of 16 inches. The upper 15 inches is yellowish brown channery loam. The lower 17 inches is a firm, brittle layer of yellowish brown sandy clay loam called a fragipan. The substratum is yellowish brown, mottled channery sandy clay loam to a depth of about 46 inches. Sandstone bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hazleton soils, the deep, poorly drained Nolo soils, and the very deep, moderately well drained Buchanan soils. Also included are some small areas of somewhat poorly drained soils that are similar to the Cookport soil. The included soils make up as much as 15 percent of this map unit.

Permeability is slow in the fragipan of the Cookport soil. Available water capacity is low or moderate. Runoff is medium. The fragipan in the subsoil restricts the rooting depth to about 16 to 27 inches. The seasonal high water table is at a depth of 12 to 30 inches. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. A few areas are used for cultivated crops or pasture.

This soil is suited to cultivated crops. In some years the seasonal high water table and ponding delay planting or damage crops. Contour stripcropping, conservation tillage, cover crops, and a cropping system that includes grasses and legumes help to reduce the runoff rate and control erosion. Installing surface and subsurface drains will remove excess water and thus will allow for timely tillage.

This soil is suited to pasture. Overgrazing and grazing when the soil is too wet compact the surface. They are the main management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment. Machine planting generally is practical.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability in the fragipan. Specially designed systems of onsite waste disposal are needed. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IIIe; the woodland ordination symbol is 4W.

CpB—Cookport channery loam, 0 to 8 percent slopes, very stony. This is a nearly level and gently sloping, deep, moderately well drained soil on broad hilltops and benches. Slopes are concave and generally are 200 to 300 feet long. Areas generally are oblong or

irregular in shape and range from 5 to 40 acres in size. Stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 6 inches thick. The subsoil extends to a depth of about 40 inches. It is mottled below a depth of 16 inches. The upper 15 inches is yellowish brown channery loam. The lower 17 inches is a firm, brittle layer of yellowish brown sandy clay loam called a fragipan. The substratum is yellowish brown, mottled channery sandy clay loam to a depth of about 46 inches. Sandstone bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hazleton soils, the deep, poorly drained Nolo soils, and the very deep, moderately well drained Buchanan soils. Also included are some small areas of somewhat poorly drained soils that are similar to the Cookport soil. The included soils make up as much as 15 percent of this map unit.

Permeability is slow in the fragipan of the Cookport soil. Available water capacity is low or moderate. Runoff is medium. The fragipan in the subsoil restricts the rooting depth to about 16 to 27 inches. The seasonal high water table is at a depth of 12 to 30 inches. In unlimed areas the soil is strongly acid or very strongly acid. Erosion is a moderate hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment. The surface stones also restrict the use of equipment.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability in the fragipan. Specially designed systems of onsite waste disposal are needed. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is VIs; the woodland ordination symbol is 4W.

CpD—Cookport channery loam, 8 to 25 percent slopes, very stony. This is a sloping and moderately steep, deep, moderately well drained soil on side slopes. Slopes are concave and generally are 200 to 300 feet long. Areas generally are oblong or irregular in shape and range from 5 to 60 acres in size. Stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 6 inches thick. The subsoil extends to a depth of about 40 inches. It is mottled below a depth of 16 inches. The upper 15 inches is yellowish brown channery loam. The lower 17 inches is a firm, brittle layer of yellowish brown sandy clay loam called a fragipan. The substratum is yellowish brown, mottled channery sandy clay loam to a depth of about 46 inches. Sandstone bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hazleton soils and the very deep, moderately well drained Buchanan soils. Also included are some small areas of somewhat poorly drained soils that are similar to the Cookport soil. The included soils make up as much as 20 percent of this map unit.

Permeability is slow in the fragipan of the Cookport soil. Available water capacity is low or moderate. Runoff is medium or rapid. The fragipan in the subsoil restricts the rooting depth to about 16 to 27 inches. The seasonal high water table is at a depth of 12 to 30 inches. In unlimed areas the soil is strongly acid or very strongly acid. The hazard of erosion is moderate or severe.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The seasonal high water table and, in some areas, the slope restrict the use of equipment. In some areas the surface stones also restrict the use of equipment.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability in the fragipan. Specially designed systems of onsite waste disposal will work on this soil. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is VIs; the woodland ordination symbol is 4W.

HaB—Hartleton channery silt loam, 3 to 8 percent slopes. This is a gently sloping, deep, well drained soil on hilltops and benches. Slopes are convex and are about 200 to 400 feet long. Areas are oblong or irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is very dark grayish

brown channery silt loam about 2 inches thick. The subsurface layer is brown channery silt loam about 3 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown very channery silt loam to a depth of about 28 inches. The lower part is yellowish brown extremely channery silt loam to a depth of about 37 inches. The substratum is yellowish brown extremely channery loam to a depth of about 46 inches. Sandstone bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the very deep, moderately well drained Buchanan soils, the deep, moderately well drained Wharton and Cookport soils, and the deep, well drained Hazleton soils. Also included are areas of soils that are similar to the Hartleton soil but are moderately deep or have fewer rock fragments throughout. The included soils make up as much as 15 percent of this map unit.

Permeability is moderate or moderately rapid in the Hartleton soil. Available water capacity is moderate. Runoff is medium. In unlimed areas the soil is strongly acid or very strongly acid throughout. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. A few areas are used for cultivated crops or pasture. A few are developed for nonfarm uses.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce the runoff rate and control erosion. Cover crops, crop residue on the surface, and a cropping system that includes grasses and legumes help to maintain the organic matter content and tilth.

This soil is suited to pasture. The main management concern is overgrazing. Proper stocking rates help to maintain the key plant species and in combination with timely deferment of grazing, rotation grazing, and applications of plant nutrients help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Few limitations affect woodland management. Constructing logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production. Machine planting generally is practical.

The depth to bedrock is a limitation affecting some urban uses. Specially designed systems of onsite waste disposal will work on this soil.

The capability subclass is IIe; the woodland ordination symbol is 4F.

HaC—Hartleton channery silt loam, 8 to 15 percent slopes. This is a sloping, deep, well drained soil on hilltops and side slopes. Slopes are convex and are about 100 to 300 feet long. Areas are oblong or irregular in shape and range from 5 to 60 acres in size.

Typically, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is brown channery silt loam about 3 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown very channery silt loam to a depth of about 28 inches. The lower part is yellowish brown extremely channery silt loam to a depth of about 37 inches. The substratum is yellowish brown extremely channery loam to a depth of about 46 inches. Sandstone bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the very deep, moderately well drained Buchanan soils, the deep, moderately well drained Wharton and Cookport soils, and the deep, well drained Hazleton soils. Also included are areas of soils that are similar to the Hartleton soil but are moderately deep or have fewer rock fragments throughout. The included soils make up as much as 20 percent of this map unit.

Permeability is moderate or moderately rapid in the Hartleton soil. Available water capacity is moderate. Runoff is medium. In unlimed areas the soil is strongly acid or very strongly acid throughout. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. A few areas are used for cultivated crops or pasture. A few are developed for nonfarm uses.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce the runoff rate and control erosion. Cover crops, crop residue on the surface, and a cropping system that includes grasses and legumes help to maintain the organic matter content and tilth.

This soil is suited to pasture. The main management concern is overgrazing. Proper stocking rates help to maintain the key plant species and in combination with timely deferment of grazing, rotation grazing, and applications of plant nutrients help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Few limitations affect woodland management. Constructing logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production. Machine planting generally is practical.

The depth to bedrock is a limitation affecting some urban uses. Specially designed systems of onsite waste disposal will work on this soil.

The capability subclass is IIIe; the woodland ordination symbol is 4F.

HaD—Hartleton channery silt loam, 15 to 25 percent slopes. This is a moderately steep, deep, well drained soil on hillsides. Slopes are convex and are about 100 to 400 feet long. Areas are oblong or irregular in shape and range from 5 to 60 acres in size.

Typically, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is brown channery silt loam about 3 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown very channery silt loam to a depth of about 28 inches. The lower part is yellowish brown extremely channery silt loam to a depth of about 37 inches. The substratum is yellowish brown extremely channery loam to a depth of about 46 inches. Sandstone bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the very deep, moderately well drained Buchanan soils, the deep, moderately well drained Wharton and Cookport soils, and the deep, well drained Hazleton soils. Also included are areas of soils that are similar to the Hartleton soil but are moderately deep or have fewer rock fragments throughout. The included soils make up as much as 20 percent of this map unit.

Permeability is moderate or moderately rapid in the Hartleton soil. Available water capacity is moderate. Runoff is rapid. In unlimed areas the soil is strongly acid or very strongly acid throughout. Erosion is a severe hazard.

Most areas of this soil are used as woodland. A few areas are used for cultivated crops or pasture. A few are developed for nonfarm uses.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce the runoff rate and control erosion. Cover crops, crop residue on the surface, and a cropping system that includes grasses and legumes help to maintain the organic matter content and tilth.

This soil is suited to pasture. The main management concern is overgrazing. Proper stocking rates help to maintain the key plant species and in combination with timely deferment of grazing, rotation grazing, and applications of plant nutrients help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Few limitations affect woodland management. Constructing logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production. Machine planting generally is practical.

The depth to bedrock is a limitation affecting onsite waste disposal and some other urban uses. Specially designed systems of onsite waste disposal will work on this soil.

The capability subclass is IVe; the woodland ordination symbol is 4R.

HaF—Hartleton channery silt loam, 25 to 60 percent slopes. This is a steep and very steep, deep, well drained soil on hillsides. Slopes are convex and are about 100 to 400 feet long. Areas are oblong or irregular in shape and range from 5 to 60 acres in size.

Typically, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is brown channery silt loam about 3 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown very channery silt loam to a depth of about 28 inches. The lower part is yellowish brown extremely channery silt loam to a depth of about 37 inches. The substratum is yellowish brown extremely channery loam to a depth of about 46 inches. Sandstone bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hazleton soils. Also included are areas of soils that are similar to the Hartleton soil but are moderately deep or have fewer rock fragments throughout. The included soils make up as much as 25 percent of this map unit.

Permeability is moderate or moderately rapid in the Hartleton soil. Available water capacity is moderate. Runoff is very rapid. In unlimed areas the soil is strongly acid or very strongly acid throughout. Erosion is a very severe hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of the slope.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The slope limits the use of equipment.

The slope and the depth to bedrock are severe limitations affecting most urban uses.

The capability subclass is VIIe; the woodland ordination symbol is 4R.

HeB—Hartleton channery silt loam, 0 to 8 percent slopes, very stony. This is a nearly level and gently sloping, deep, well drained soil on hilltops. Slopes are convex and are about 100 to 300 feet long. Areas are oblong or irregular in shape and range from 5 to 40 acres in size. Stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is brown channery silt loam about 3 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown very channery silt loam to a depth of about 28 inches. The lower part is yellowish brown extremely channery silt loam to a depth of about

37 inches. The substratum is yellowish brown extremely channery loam to a depth of about 46 inches. Sandstone bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the very deep, moderately well drained Buchanan soils, the deep, moderately well drained Wharton and Cookport soils, and the deep, well drained Hazleton soils. Also included are areas of soils that are similar to the Hartleton soil but are moderately steep or have fewer rock fragments throughout. The included soils make up as much as 15 percent of this map unit.

Permeability is moderate or moderately rapid in the Hartleton soil. Available water capacity is moderate. Runoff is medium. In unlimed areas the soil is strongly acid or very strongly acid throughout. Erosion is a moderate hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to pasture. The main management concern is overgrazing. Proper stocking rates help to maintain the key plant species and in combination with timely deferment of grazing, rotation grazing, and applications of plant nutrients help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Surface stones limit the use of equipment. Constructing logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production. Machine planting generally is practical.

The depth to bedrock is a limitation affecting some urban uses. Specially designed systems of onsite waste disposal will work on this soil.

The capability subclass is VIs; the woodland ordination symbol is 4F.

HeD—Hartleton channery silt loam, 8 to 25 percent slopes, very stony. This is a sloping and moderately steep, deep, well drained soil on hilltops. Slopes are convex and are about 100 to 400 feet long. Areas are oblong or irregular in shape and range from 5 to 60 acres in size. Stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is brown channery silt loam about 3 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown very channery silt loam to a depth of about 28 inches. The lower part is yellowish brown extremely channery silt loam to a depth of about 37 inches. The substratum is yellowish brown extremely channery loam to a depth of about 46 inches. Sandstone bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the very deep, moderately well drained Buchanan soils, the deep, moderately well drained Wharton and Cookport soils, and the deep, well drained Hazleton soils. Also included are areas of soils that are similar to the Hartleton soil but are moderately deep or have fewer rock fragments throughout. The included soils make up as much as 20 percent of this map unit.

Permeability is moderate or moderately rapid in the Hartleton soil. Available water capacity is moderate. Runoff is medium or rapid. In unlimed areas the soil is strongly acid or very strongly acid throughout. The hazard of erosion is moderate or severe.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Surface stones limit the use of equipment. Constructing logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production. Machine planting generally is practical.

The surface stones and the depth to bedrock are limitations affecting some urban uses. The surface stones affect onsite waste disposal. Specially designed systems of onsite waste disposal will work on this soil.

The capability subclass is VIs; the woodland ordination symbol is 4R.

HoB—Hazleton channery loam, 3 to 8 percent slopes. This is a gently sloping, deep, well drained soil on hilltops. Slopes are convex and are about 200 to 400 feet long. Areas generally are oblong or irregular in shape and range from 8 to 40 acres in size.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 4 inches thick. The subsoil extends to a depth of about 36 inches. The upper 2 inches is dark reddish brown channery sandy loam. The lower 28 inches is yellowish brown very channery sandy loam. The substratum is yellowish brown extremely channery loamy sand to a depth of about 54 inches. Sandstone bedrock is at a depth of 54 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hartleton soils and the deep, moderately well drained Cookport soils. Also included are areas of soils that are similar to the Hazleton soil but are moderately deep, have fewer rock fragments throughout, or are stony. The included soils make up as much as 15 percent of this map unit.

Permeability is moderately rapid or rapid in the

subsoil of the Hazleton soil. Available water capacity is moderate. Runoff is medium. In unlimed areas the soil is strongly acid to extremely acid throughout. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. A few areas are used for pasture or cultivated crops.

This soil is suited to cultivated crops. Stripcropping, conservation tillage, diversions, and grassed waterways help to reduce the runoff rate and control erosion. Cover crops, crop residue management, and a cropping system that includes hay help to maintain the organic matter content and good tilth.

This soil is suited to pasture. The main management concern is overgrazing. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing help to keep the soil and pasture in good condition. Applying plant nutrients increases forage yields.

This soil is suited to trees. The potential productivity is moderately high. Few limitations affect woodland management. Machine planting generally is practical. Building logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production.

The limitations affecting some urban uses are large stones and a poor filtering capacity. Because of its permeability, the soil is a poor filter of effluent. If the soil is used for onsite waste disposal, ground water contamination is a hazard. The large stones are a limitation on sites for dwellings with basements.

The capability subclass is IIe; the woodland ordination symbol is 4F.

HoC—Hazleton channery loam, 8 to 15 percent slopes. This is a sloping, deep, well drained soil on hilltops. Slopes are convex and are about 100 to 300 feet long. Areas generally are oblong or irregular in shape and range from 8 to 60 acres in size.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 4 inches thick. The subsoil extends to a depth of about 36 inches. The upper 2 inches is dark reddish brown channery sandy loam. The lower 28 inches is yellowish brown very channery sandy loam. The substratum is yellowish brown extremely channery loamy sand to a depth of about 54 inches. Sandstone bedrock is at a depth of 54 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hartleton soils and the deep, moderately well drained Cookport soils. Also included are areas of soils that are similar to the Hazleton soil but are moderately deep, have fewer rock fragments throughout, or are stony. The included soils make up as much as 15 percent of this map unit.

Permeability is moderately rapid or rapid in the subsoil of the Hazleton soil. Available water capacity is moderate. Runoff is medium. In unlimed areas the soil is strongly acid to extremely acid throughout. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. A few areas are used for pasture or cultivated crops.

This soil is suited to cultivated crops. Stripcropping, conservation tillage, diversions, and grassed waterways help to reduce the runoff rate and control erosion. Cover crops, crop residue management, and a cropping system that includes hay help to maintain the organic matter content and good tilth.

This soil is suited to pasture. The main management concern is overgrazing. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing help to keep the soil and pasture in good condition. Applying plant nutrients increases forage yields.

This soil is suited to trees. The potential productivity is moderately high. Few limitations affect woodland management. Machine planting generally is practical. Building logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production.

The limitations affecting some urban uses are large stones and a poor filtering capacity. The large stones are a limitation on sites for dwellings with basements. Because of its permeability, the soil is a poor filter of effluent. If the soil is used for onsite waste disposal, ground water contamination is a hazard.

The capability subclass is IIIe; the woodland ordination symbol is 4F.

HoD—Hazleton channery loam, 15 to 25 percent slopes. This is a moderately steep, deep, well drained soil on hilltops. Slopes are convex and are about 100 to 400 feet long. Areas generally are oblong or irregular in shape and range from 8 to 60 acres in size.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 4 inches thick. The subsoil extends to a depth of about 36 inches. The upper 2 inches is dark reddish brown channery sandy loam. The lower 28 inches is yellowish brown very channery sandy loam. The substratum is yellowish brown extremely channery loamy sand to a depth of about 54 inches. Sandstone bedrock is at a depth of 54 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hartleton soils and the deep, moderately well drained Cookport soils. Also included are areas of soils that are similar to the

Hazleton soil but are moderately deep, have fewer rock fragments throughout, or are stony. The included soils make up as much as 20 percent of this map unit.

Permeability is moderately rapid or rapid in the subsoil of the Hazleton soil. Available water capacity is moderate. Runoff is rapid. In unlimed areas the soil is strongly acid to extremely acid throughout. Erosion is a severe hazard.

Most areas of this soil are used as woodland. A few areas are used for pasture or cultivated crops.

This soil is suited to cultivated crops. Erosion is a severe hazard. Stripcropping, conservation tillage, diversions, and grassed waterways help to reduce the runoff rate and control erosion. Cover crops, crop residue management, and a cropping system that includes hay help to maintain the organic matter content and good tilth.

This soil is suited to pasture. The main management concern is overgrazing. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing help to keep the soil and pasture in good condition. Applying plant nutrients increases forage yields.

This soil is suited to trees. The potential productivity is moderately high. Few limitations affect woodland management. Machine planting generally is practical. Building logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production.

The limitations affecting some urban uses are the slope, large stones, and a poor filtering capacity. The large stones are a limitation on sites for dwellings with basements. The slope and the poor filtering capacity are limitations affecting onsite waste disposal. Because of its permeability, the soil is a poor filter of effluent. If the soil is used for onsite waste disposal, ground water contamination is a hazard.

The capability subclass is IVe; the woodland ordination symbol is 4F.

HxB—Hazleton channery loam, 0 to 8 percent slopes, very stony. This is a gently sloping, deep, well drained soil on hilltops. Slopes are convex and are about 200 to 400 feet long. Areas generally are oblong or irregular in shape and range from 8 to 40 acres in size. Stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 4 inches thick. The subsoil extends to a depth of about 36 inches. The upper 2 inches is dark reddish brown channery sandy loam. The lower 28 inches is yellowish brown very channery sandy loam. The substratum is yellowish brown extremely channery loamy sand to a depth of about 54 inches. Sandstone bedrock is at a depth of 54 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hartleton soils and the deep, moderately well drained Cookport soils. Also included are areas of soils that are similar to the Hazleton soil but are moderately deep or have fewer rock fragments throughout. The included soils make up as much as 15 percent of this map unit.

Permeability is moderately rapid or rapid in the subsoil of the Hazleton soil. Available water capacity is moderate. Runoff is medium. In unlimed areas the soil is strongly acid to extremely acid throughout. Erosion is a moderate hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous surface stones.

This soil is suited to trees. The potential productivity is moderately high. Few limitations affect woodland management. In some areas stones limit the use of machinery. Building logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production.

The limitations affecting onsite waste disposal and some other urban uses are large stones and a poor filtering capacity. The large stones are a limitation on sites for dwellings with basements. Because of its permeability, the soil is a poor filter of effluent. If the soil is used for onsite waste disposal, ground water contamination is a hazard.

The capability subclass is VIs; the woodland ordination symbol is 4F.

HxD—Hazleton channery loam, 8 to 25 percent slopes, very stony. This is a sloping and moderately steep, deep, well drained soil on hilltops. Slopes are convex and are about 100 to 400 feet long. Areas generally are oblong or irregular in shape and range from 8 to 60 acres in size. Stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 4 inches thick. The subsoil extends to a depth of about 36 inches. The upper 2 inches is dark reddish brown channery sandy loam. The lower 28 inches is yellowish brown very channery sandy loam. The substratum is yellowish brown extremely channery loamy sand to a depth of about 54 inches. Sandstone bedrock is at a depth of 54 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hartleton soils and the

deep, moderately well drained Cookport soils. Also included are areas of soils that are similar to the Hazleton soil but are moderately deep or have fewer rock fragments throughout. The included soils make up as much as 15 percent of this map unit.

Permeability is moderately rapid or rapid in the subsoil of the Hazleton soil. Available water capacity is moderate. Runoff is rapid. In unlimed areas the soil is strongly acid to extremely acid throughout. Erosion is a severe hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous surface stones.

This soil is suited to trees. The potential productivity is moderately high. In some areas the numerous surface stones limit the use of equipment. Building logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production.

The limitations affecting some urban uses are large stones, a poor filtering capacity, and, in some areas, the slope. The large stones and the poor filtering capacity are limitations affecting onsite waste disposal. The large stones also are a limitation on sites for dwellings with basements. Because of its permeability, the soil is a poor filter of effluent. If the soil is used for onsite waste disposal, ground water contamination is a hazard.

The capability subclass is VIs; the woodland ordination symbol is 4F.

HxF—Hazleton channery loam, 25 to 60 percent slopes, very stony. This is a steep and very steep, deep, well drained soil on hilltops. Slopes are convex and are about 100 to 400 feet long. Areas generally are oblong or irregular in shape and range from 8 to 60 acres in size. Stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 4 inches thick. The subsoil extends to a depth of about 36 inches. The upper 2 inches is dark reddish brown channery sandy loam. The lower 28 inches is yellowish brown very channery sandy loam. The substratum is yellowish brown extremely channery loamy sand to a depth of about 54 inches. Sandstone bedrock is at a depth of 54 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hartleton soils. Also included are areas of soils that are similar to the Hazleton soil but are moderately deep or have fewer rock fragments throughout. The included soils make up as much as 25 percent of this map unit.

Permeability is moderately rapid or rapid in the subsoil of the Hazleton soil. Available water capacity is moderate. Runoff is very rapid. In unlimed areas the soil is strongly acid to extremely acid throughout. Erosion is a very severe hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous surface stones.

This soil is suited to trees. The potential productivity is moderately high. The slope and the numerous surface stones limit the use of equipment. Building logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production.

The limitations affecting some urban uses are large stones and a poor filtering capacity. The large stones are a limitation on sites for dwellings with basements. The poor filtering capacity is a limitation affecting onsite waste disposal. Because of its permeability, the soil is a poor filter of effluent. If the soil is used for onsite waste disposal, ground water contamination is a hazard.

The capability subclass is VIIs; the woodland ordination symbol is 4R.

HyE—Hazleton channery loam, 8 to 35 percent slopes, extremely bouldery. This is a steep, deep, well drained soil on hilltops. Slopes are convex and are about 200 to 400 feet long. Areas generally are oblong or irregular in shape and range from 8 to 60 acres in size. Boulders 2 to 10 feet in diameter cover about 15 to 50 percent of the surface.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 4 inches thick. The subsoil extends to a depth of about 36 inches. The upper 2 inches is dark reddish brown channery sandy loam. The lower 28 inches is yellowish brown very channery sandy loam. The substratum is yellowish brown extremely channery loamy sand to a depth of about 54 inches. Sandstone bedrock is at a depth of 54 inches.

Included with this soil in mapping are some small areas of the deep, well drained Hartleton soils and the deep, moderately well drained Cookport soils. Also included are areas of soils that are similar to the Hazleton soil but are moderately deep or have fewer rock fragments. The included soils make up as much as 25 percent of this map unit.

Permeability is moderately rapid or rapid in the subsoil of the Hazleton soil. Available water capacity is moderate. Runoff is very rapid. In unlimed areas the soil is strongly acid to extremely acid throughout. Erosion is a very severe hazard.

Most areas are used as woodland. This soil is

unsuited to cultivated crops and poorly suited to improved pasture because of numerous boulders on the surface.

This soil is suited to trees. The potential productivity is moderately high. The slope and the surface boulders severely limit the use of equipment.

The slope and the surface boulders are severe limitations affecting most urban uses. Because of its permeability, the soil is a poor filter of effluent. If the soil is used for onsite waste disposal, ground water contamination is a hazard.

The capability subclass is VIIs; the woodland ordination symbol is 4R.

LeB—Leck Kill channery silt loam, 3 to 8 percent slopes. This is a gently sloping, deep, well drained soil on hilltops. Slopes are convex and are about 200 to 400 feet long. Areas generally are elongated and are 5 to 20 acres in size.

Typically, the surface layer is dark brown channery silt loam about 2 inches thick. The subsurface layer is weak red channery silt loam about 3 inches thick. The subsoil, to a depth of about 28 inches, is reddish brown channery silt loam. The substratum is weak red extremely channery silt loam to a depth of about 46 inches. Red shale bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the very deep, moderately well drained and somewhat poorly drained Albrights soils. Also included are very deep and moderately deep, well drained soils that are similar to the Leck Kill soil. The included soils make up as much as 15 percent of this map unit.

Permeability is moderate or moderately rapid in the subsoil of the Leck Kill soil. Available water capacity is moderate. Runoff is medium. In unlimed areas the soil is strongly acid or very strongly acid throughout. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. Some areas are used for cultivated crops or pasture.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, diversions, and grassed waterways help to reduce the runoff rate and control erosion. Cover crops, crop residue management, and a cropping system that includes hay help to maintain the organic matter content and good tilth.

This soil is suited to pasture. The main management concern is overgrazing. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing help to keep the soil and pasture in good condition. Applying plant nutrients increases forage yields.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Few limitations affect woodland management. Removing undesirable trees helps to increase timber production. Building logging roads on the contour helps to control erosion. Machine planting generally is practical.

This soil has few limitations as a site for urban uses, but the depth to bedrock and the permeability are limitations affecting onsite waste disposal. In places enlarged absorption fields installed in the areas deepest to bedrock or specially designed systems will work on this soil.

The capability subclass is IIe; the woodland ordination symbol is 4A.

LeC—Leck Kill channery silt loam, 8 to 15 percent slopes. This is a sloping, deep, well drained soil on hilltops. Slopes are convex and are about 200 to 400 feet long. Areas generally are elongated and are 5 to 40 acres in size.

Typically, the surface layer is dark brown channery silt loam about 2 inches thick. The subsurface layer is weak red channery silt loam about 3 inches thick. The subsoil is reddish brown channery silt loam to a depth of about 28 inches. The substratum is weak red extremely channery silt loam to a depth of about 46 inches. Red shale bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of the very deep, moderately well drained and somewhat poorly drained Albrights soils. Also included are very deep and moderately deep, well drained soils that are similar to the Leck Kill soil. The included soils make up as much as 20 percent of this map unit.

Permeability is moderate or moderately rapid in the subsoil of the Leck Kill soil. Available water capacity is moderate. Runoff is medium. In unlimed areas the soil is strongly acid or very strongly acid throughout. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. Some areas are used for cultivated crops or pasture.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, diversions, and grassed waterways help to reduce the runoff rate and control erosion. Cover crops, crop residue management, and a cropping system that includes hay help to maintain the organic matter content and good tilth.

This soil is suited to pasture. The main management concern is overgrazing. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing help to keep the soil and pasture in good condition. Applying plant nutrients increases forage yields.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Few limitations affect woodland management. Removing undesirable

trees helps to increase timber production. Building logging roads on the contour helps to control erosion. Machine planting generally is practical.

This soil has few limitations as a site for urban uses, but the depth to bedrock and the permeability are limitations affecting onsite waste disposal. In places enlarged absorption fields installed in the areas deepest to bedrock or specially designed systems will work on this soil.

The capability subclass is IIIe; the woodland ordination symbol is 4A.

LeD—Leck Kill channery silt loam, 15 to 25 percent slopes. This is a moderately steep, deep, well drained soil on hilltops. Slopes are convex and are about 200 to 400 feet long. Areas generally are elongated and are 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is weak red channery silt loam about 3 inches thick. The subsoil is reddish brown channery silt loam to a depth of about 28 inches. The substratum is weak red extremely channery silt loam to a depth of about 46 inches. Red shale bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of soils that are shallower to bedrock than the Leck Kill soil. The included soils make up as much as 25 percent of this map unit.

Permeability is moderate or moderately rapid in the subsoil of the Leck Kill soil. Available water capacity is moderate. Runoff is rapid. In unlimed areas the soil is strongly acid or very strongly acid throughout. Erosion is a severe hazard.

Most areas of this soil are used as woodland. Some areas are used for cultivated crops or pasture.

This soil is suited to cultivated crops. Erosion is a severe hazard. Contour stripcropping, conservation tillage, diversions, and grassed waterways help to reduce the runoff rate and control erosion. Cover crops, crop residue on the surface, and a cropping system that includes hay help to maintain the organic matter content and good tilth.

This soil is suited to pasture. The main management concern is overgrazing. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing help to keep the soil and pasture in good condition. Applying plant nutrients increases forage yields.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. Few limitations affect woodland management. Removing undesirable trees helps to increase timber production. Building logging roads on the contour helps to control erosion. Machine planting generally is practical.

The limitations affecting onsite waste disposal and many other urban uses are the depth to bedrock, the slope, and the permeability. In places enlarged absorption fields installed in the areas deepest to bedrock or specially designed systems will work on this soil.

The capability subclass is IVe; the woodland ordination symbol is 4R.

LeF—Leck Kill channery silt loam, 25 to 60 percent slopes. This is a very steep, deep, well drained soil on hillsides. Slopes are convex and are about 100 to 400 feet long. Areas generally are elongated and are 5 to 60 acres in size.

Typically, the surface layer is dark brown channery silt loam about 2 inches thick. The subsurface layer is weak red channery silt loam about 3 inches thick. The subsoil is reddish brown channery silt loam to a depth of about 28 inches. The substratum is weak red extremely channery silt loam to a depth of about 46 inches. Red shale bedrock is at a depth of 46 inches.

Included with this soil in mapping are some small areas of soils that are shallower to bedrock than the Leck Kill soil. The included soils make up as much as 25 percent of this map unit.

Permeability is moderate or moderately rapid in the subsoil of the Leck Kill soil. Available water capacity is moderate. Runoff is very rapid. In unlimed areas the soil is strongly acid or very strongly acid throughout. Erosion is a very severe hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of the slope.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The slope limits the use of equipment.

The limitations affecting onsite waste disposal, dwellings, and most other urban uses are the depth to bedrock and the slope.

The capability subclass is VIIe; the woodland ordination symbol is 4R.

NoA—Nolo loam, 0 to 3 percent slopes. This is a nearly level, deep, poorly drained soil along waterways and in swales and depressions (fig. 7). Slopes are concave and are about 200 to 300 feet long. Areas generally are elongated and are 5 to 20 acres in size.

Typically, 1 inch of forest litter and 2 inches of black, decomposed organic matter cover the surface. The surface layer is very dark gray loam about 4 inches thick. The subsurface layer is light brownish gray loam about 5 inches thick. The subsoil extends to a depth of about 45 inches. In downward sequence, it is 11 inches

Figure 7.—Wetland in an area of Nolo loam, 0 to 3 percent slopes. This soil provides food and cover for wetland wildlife.

of light brownish gray, mottled sandy clay loam; 12 inches of grayish brown, mottled sandy clay loam called a fragipan; and 13 inches of grayish brown, mottled channery sandy clay loam called a fragipan. Grayish brown sandstone bedrock is at a depth of 45 inches.

Included with this soil in mapping are some small areas of the very deep, poorly drained Brinkerton soils. Also included are some small areas of soils that are similar to the Nolo soil but are somewhat poorly drained. The included soils make up as much as 15 percent of this map unit.

Permeability is slow in the fragipan of the Nolo soil. Available water capacity is moderate. Runoff is very slow or ponded. The firm, brittle fragipan in the subsoil restricts the rooting depth to about 16 to 30 inches. The seasonal high water table is within a depth of 6 inches for long periods. In unlimed areas the soil is very strongly acid or extremely acid throughout. Erosion is a slight hazard.

Most areas of this soil are used as woodland. A few areas are used as pasture.

This soil is poorly suited to cultivated crops. The seasonal high water table is a limitation. It causes the soil to warm up slowly in spring. Ponding can damage crops. Keeping natural drainageways open helps to remove excess surface water. Surface and subsurface drains will improve drainage.

This soil is suited to pasture. Overgrazing and grazing when the soil is too wet compact the surface. They are the main management concerns. Proper

stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition. Installing subsurface and surface drains will improve drainage.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table and the fragipan restrict the rooting depth. The seasonal high water table restricts the use of equipment for long periods.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability. Better drained sites are better suited to onsite waste disposal. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IVw; the woodland ordination symbol is 4W.

NoB—Nolo loam, 3 to 8 percent slopes. This is a gently sloping, deep, poorly drained soil along waterways and in swales and depressions. Slopes are concave and are about 200 to 300 feet long. Areas generally are elongated and are 5 to 30 acres in size.

Typically, 1 inch of forest litter and 2 inches of black, decomposed organic matter cover the surface. The surface layer is very dark gray loam about 4 inches thick. The subsurface layer is light brownish gray loam about 5 inches thick. The subsoil extends to a depth of about 45 inches. In downward sequence, it is 11 inches of light brownish gray, mottled sandy clay loam; 12 inches of grayish brown, mottled sandy clay loam called a fragipan; and 13 inches of grayish brown, mottled channery sandy clay loam called a fragipan. Grayish brown sandstone bedrock is at a depth of 45 inches.

Included with this soil in mapping are some small areas of the deep, moderately well drained Cookport soils and the very deep, poorly drained Brinkerton soils. Also included are some small areas of soils that are similar to the Nolo soil but are somewhat poorly drained. The included soils make up as much as 15 percent of this map unit.

Permeability is slow in the fragipan of the Nolo soil. Available water capacity is moderate. Runoff is slow. The firm, brittle fragipan in the subsoil restricts the rooting depth to about 16 to 30 inches. The seasonal high water table is within a depth of 6 inches for long periods. In unlimed areas the soil is very strongly acid or extremely acid throughout. Erosion is a slight hazard.

Most areas of this soil are used as woodland. A few areas are used as pasture.

This soil is poorly suited to cultivated crops. The seasonal high water table is a limitation. It causes the soil to warm up slowly in spring. Ponding can damage crops. Keeping natural drainageways open helps to remove excess surface water. Installing surface and subsurface drains will improve drainage. Conservation tillage, stripcropping, and cover crops help to reduce the runoff rate and control erosion. Cover crops and crop residue on the surface help to maintain the organic matter content and good tilth.

This soil is suited to pasture. Overgrazing and grazing when the soil is too wet will compact the surface. They are the main management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition. Installing subsurface and surface drains will improve drainage.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table and the fragipan restrict the rooting depth. The seasonal high water table restricts the use of equipment for long periods.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the slow permeability. Better drained sites are better suited to onsite waste disposal. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IVw; the woodland ordination symbol is 4W.

NxB—Nolo loam, 0 to 8 percent slopes, very stony. This is a nearly level and gently sloping, deep, poorly drained soil along waterways and in swales and depressions. Slopes are concave and are about 200 to 300 feet long. Areas generally are elongated and are 5 to 30 acres in size. Stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, 1 inch of forest litter and 2 inches of black, decomposed organic matter cover the surface. The surface layer is very dark gray loam about 4 inches thick. The subsurface layer is light brownish gray loam about 5 inches thick. The subsoil extends to a depth of about 45 inches. In downward sequence, it is 11 inches of light brownish gray, mottled sandy clay loam; 12 inches of grayish brown, mottled sandy clay loam called a fragipan; and 13 inches of grayish brown, mottled channery sandy clay loam called a fragipan. Grayish brown sandstone bedrock is at a depth of 45 inches.

Included with this soil in mapping are some small areas of the deep, moderately well drained Cookport soils and the very deep, poorly drained Brinkerton soils. Also included are some small areas of soils that are similar to the Nolo soil but are somewhat poorly

drained. The included soils make up as much as 20 percent of this map unit.

Permeability is slow in the fragipan of the Nolo soil. Available water capacity is moderate. Runoff is slow. The firm, brittle fragipan in the subsoil restricts the rooting depth to about 16 to 30 inches. The seasonal high water table is within a depth of 6 inches for long periods. In unlimed areas the soil is very strongly acid or extremely acid throughout. Erosion is a slight hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table and the fragipan restrict the rooting depth. The seasonal high water table restricts the use of equipment for long periods.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the surface stones, the seasonal high water table, and the slow permeability. Better drained sites are better suited to onsite waste disposal. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is VIIs; the woodland ordination symbol is 4W.

Ph—Philo silt loam. This is a nearly level, very deep, moderately well drained soil on flood plains. Slopes are about 100 to 300 feet long. They range from 0 to 3 percent. Areas are long and narrow and are mainly 5 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil extends to a depth of about 30 inches. It is yellowish brown loam in the upper 7 inches and yellowish brown, mottled loam in the lower 16 inches. The substratum extends to a depth of about 72 inches. It is gray, mottled channery sandy loam between depths of 30 and 40 inches and silt, sand, and gravel between depths of 40 and 72 inches.

Included with this soil in mapping are some small areas of the very deep, poorly drained Atkins soils and the very deep, well drained Pope soils. The included soils make up as much as 15 percent of this map unit.

Permeability and available water capacity are moderate in the Philo soil. Runoff is slow. The seasonal high water table is at a depth of 18 to 36 inches. This soil is subject to occasional flooding of brief duration. In unlimed areas the soil is strongly acid or very strongly acid throughout. Erosion is a slight hazard.

Most areas of this soil are used as woodland. Some areas are used for cultivated crops or pasture.

This soil is suited to cultivated crops. Flooding is a hazard. It can damage crops. Cover crops, crop residue on the surface, and a cropping system that includes grasses and legumes help to maintain the organic matter content and good tilth and reduce the hazard of scouring by floodwater. Installing surface and subsurface drains will lower the water table and thus will allow for timely tillage.

This soil is suited to pasture. Overgrazing and grazing when the soil is wet will compact the surface. They are the major management concerns. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for red maple is moderately high. Removing undesirable trees helps to increase timber production. The seasonal high water table restricts the use of equipment during wet periods. Machine planting generally is practical.

The limitations affecting onsite waste disposal, dwellings with basements, and some other urban uses are the flooding and the seasonal high water table. Because of its permeability, the soil is a poor filter of effluent. If the soil is used for onsite waste disposal, ground water contamination is a hazard.

The capability subclass is IIw; the woodland ordination symbol is 4W.

Po—Pope silt loam. This is a nearly level, very deep, well drained soil on flood plains. Slopes are about 100 to 300 feet long. They range from 0 to 3 percent. Areas are long and narrow and are mainly 5 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is yellowish brown fine sandy loam to a depth of about 40 inches. The substratum extends to a depth of about 66 inches. Between depths of 40 and 50 inches, it is yellowish brown, mottled gravelly sandy loam. Between depths of 50 and 66 inches, it is brown, mottled very gravelly sandy loam.

Included with this soil in mapping are some small areas of the very deep, moderately well drained Philo soils and the very deep, poorly drained Atkins soils. The included soils make up as much as 20 percent of this map unit.

Permeability is moderately rapid in the Pope soil. Available water capacity is high. Runoff is slow. This soil is subject to rare flooding of very brief duration. In unlimed areas it is strongly acid or very strongly acid throughout. Erosion is a slight hazard.

Most areas of this soil are used as woodland. A few areas are used for cultivated crops or pasture.

This soil is suited to cultivated crops. In some years floodwater can damage crops. Cover crops, crop residue on the surface, and a cropping system that includes hay help to maintain the organic matter content and good tilth and reduce the hazard of scouring by floodwater.

This soil is suited to pasture. The major management concern is overgrazing. Proper stocking rates, timely deferment of grazing, and rotation grazing help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is high. Few limitations affect woodland management. In some years flooding limits the use of machinery for short periods, but machine planting generally is practical. Removing undesirable trees will increase timber production.

Flooding is a hazard on sites for waste disposal systems, dwellings with basements, and most other urban uses.

The capability class is I; the woodland ordination symbol is 7A.

Ub—Udifluvents-Buchanan complex. The soils in this map unit are nearly level and gently sloping, very deep, and well drained and moderately well drained. The Udifluvents are on flood plains. The Buchanan soil is on toe slopes adjacent to areas of the Udifluvents. Slopes are about 150 to 300 feet long. They range from 0 to 8 percent. Areas are long and narrow and are mainly 20 to 60 acres in size.

The Udifluvents and the Buchanan soil occur as areas so intricately mixed or so narrow that they could not be separated in mapping. Every delineation has both soils. This map unit is about 50 percent Udifluvents, 40 percent Buchanan soil, and 10 percent other soils.

The Udifluvents differ from place to place. Generally, they have a surface layer of dark brown very gravelly sandy loam about 5 to 7 inches thick. The substratum extends to a depth of 60 inches or more. It generally is dark brown and yellowish brown very channery loam to sandy loam.

Typically, the surface layer of the Buchanan soil is very dark gray silt loam about 3 inches thick. The subsurface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil is about 30 inches thick. In sequence downward, it is yellowish brown silt loam to a depth of about 17 inches; yellowish brown, mottled silt loam to a depth of about 25 inches; and a fragipan of firm, brittle, brown, mottled channery loam to a depth of about 40 inches. The substratum is brown, mottled channery loam to a depth of 66 inches.

Included with the Udifluvents and the Buchanan soil in mapping are some small areas of the stony, very deep, moderately well drained Philo soils.

Permeability is rapid in the Udifluvents. Available water capacity is low or moderate. Runoff is slow. These soils are subject to occasional flooding of very brief duration. The seasonal high water table is at a depth of 18 to 30 inches during wet periods. In unlimed areas the soils are extremely acid to strongly acid throughout.

Permeability is moderate above the fragipan in the Buchanan soil and slow in the fragipan. Available water capacity is moderate. Runoff is medium. The fragipan is at a depth of about 20 to 30 inches. The seasonal high water table is at a depth of about 18 to 30 inches. The water table and the fragipan both restrict the rooting depth. In unlimed areas the soil is strongly acid or very strongly acid throughout.

Most areas of these soils are used as woodland. A few small areas are used as pasture or as recreation areas, such as hunting camps.

Because of flooding on the Udifluvents, this unit is unsuited to cultivated crops and poorly suited to pasture.

The Buchanan soil is suited to trees. The potential productivity for northern red oak is moderately high. Removing undesirable trees helps to increase timber production. The flooding on the Udifluvents sometimes limits the use of machinery and woodland productivity.

The slow permeability in the fragipan of the Buchanan soil is a limitation affecting onsite waste disposal, dwellings with basements, and most other urban uses. The flooding on the Udifluvents is a severe hazard affecting onsite waste disposal and dwellings.

In areas of the Buchanan soil, the capability subclass is IIe and the woodland ordination symbol is 4A. The Udifluvents are not assigned a capability subclass or a woodland ordination symbol.

Ud—Udorthents, sandstone and shale. These are nearly level to very steep, very deep, well drained and moderately well drained soils on uplands. These soils consist of high walls and large piles of mixed soil and bedrock material derived from surface mining. Slopes vary in shape and length. Areas are round or elongated and are about 20 to 200 acres in size.

These soils differ greatly from place to place. In many areas the surface layer is brown very channery silt loam. The substratum is sandy loam to silty clay loam. It has a high content of rock fragments.

Included with these soils in mapping are a few small areas of mine dumps, sanitary landfills, stone quarries, and gravel pits. Also included are long, narrow areas of soils that have not been altered by mining activities. The included areas are in such intricate patterns and are so small that mapping them separately from the

Udorthents was not practical. They make up as much as 20 percent of this map unit.

Permeability is slow to rapid in the Udorthents. Runoff is rapid or very rapid, depending on the slope and the plant cover. Available water capacity is low or moderate. In unlimed areas the soils are strongly acid to extremely acid throughout. The hazard of erosion is moderate to very severe.

Most areas of these soils support indigenous shrubs and trees or are idle. Some areas are planted to trees, shrubs, and grasses.

Reclamation and clearing of rock fragments from these soils are needed for all uses. Onsite investigation is needed to determine the potentials and limitations for any proposed use.

These soils are not assigned a capability subclass or a woodland ordination symbol.

Us—Udorthents, sandstone and shale, smoothed. These are nearly level to moderately steep, very deep, well drained and moderately well drained soils on uplands. They are mainly in the southwestern part of Elk County. They have been backfilled and restored to the original surface contour. Most of the material is derived from excavating and stripping away overburden during coal mining. Slopes vary in shape and length. Areas are round or elongated and are about 20 to 200 acres in size.

These soils differ greatly from place to place. Generally, the surface layer is brown very channery silt loam. The substratum is sandy loam to silty clay loam. It has a high content of rock fragments.

Included with these soils in mapping are some small areas of mine dumps, sanitary landfills, and stone quarries. Also included are some long, narrow areas of soils that have not been altered by mining activities. The included areas are in such intricate patterns and are so small that mapping them separately from the Udorthents was not practical. They make up as much as 20 percent of this map unit.

Permeability is slow to rapid in the Udorthents. Runoff is medium to very rapid, depending on the slope and the plant cover. Available water capacity is low or moderate. In unlimed areas the soils are strongly acid to extremely acid throughout. The hazard of erosion is moderate to very severe.

Most areas of these soils are planted to grasses, shrubs, and trees (fig. 8). A few backfilled areas are developed for recreational or industrial uses.

The suitability of these soils for nonfarm uses depends on the alteration of the original soils and the restoration of the backfilled material. Onsite investigation is needed to determine the potential and limitations for any proposed use.

These soils are not assigned a capability subclass or a woodland ordination symbol.

WaB—Wharton silt loam, 3 to 8 percent slopes. This is a gently sloping, deep, moderately well drained soil on hilltops and benches. Slopes are slightly concave and are about 100 to 400 feet long. Areas generally are oblong or oval and are 5 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 37 inches thick. The upper part is yellowish brown silty clay loam to a depth of about 20 inches. The lower part is yellowish brown channery silty clay loam to a depth of about 44 inches. The substratum is light yellowish brown, mottled very channery silty clay loam to a depth of about 56 inches. Siltstone and shale are at a depth of 56 inches.

Included with this soil in mapping are some small areas of the deep, somewhat poorly drained Cavode soils, the very deep, moderately well drained Buchanan soils, and the deep, well drained Hartleton soils. The included soils make up as much as 20 percent of this map unit.

Permeability is slow or moderately slow in the subsoil of the Wharton soil. Available water capacity is moderate. Runoff is medium. The seasonal high water table restricts root growth during wet periods. In unlimed areas the soil is strongly acid or very strongly acid in the surface layer and subsoil and strongly acid to extremely acid in the substratum. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. A few areas are used for cultivated crops or pasture.

This soil is suited to cultivated crops. Erosion is a moderate hazard. Contour stripcropping, conservation tillage, diversion terraces, and grassed waterways help to reduce the runoff rate and control erosion. Cover crops, crop residue on the surface, and a cropping system that includes hay help to maintain the organic matter content and good tilth. Installing surface and subsurface drains in wet areas will allow for timely tillage and harvesting.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table restricts the use of equipment during wet periods. Machine planting generally is practical. Constructing logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the moderately slow or slow permeability. Specially designed systems

Figure 8.—Spruce trees planted in an area of Udorthents, sandstone and shale, smoothed. During reclamation of these soils, which have been surface mined, the soil layers have been replaced in the proper sequence.

of onsite waste disposal are needed on this soil. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IIe; the woodland ordination symbol is 4A.

WaC—Wharton silt loam, 8 to 15 percent slopes. This is a sloping, deep, moderately well drained soil on hilltops and benches. Slopes are slightly concave and are about 100 to 400 feet long. Areas generally are oblong or oval and are 4 to 60 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 37 inches thick. The upper part is yellowish brown silty clay loam to a depth of about 20 inches. The lower part is yellowish brown channery silty clay loam to a depth of about 44 inches. The substratum is light yellowish brown, mottled very channery silty clay loam to a depth of about 56 inches. Siltstone and shale are at a depth of 56 inches.

Included with this soil in mapping are some small areas of the deep, somewhat poorly drained Cavode soils, the very deep, moderately well drained Buchanan soils, and the deep, well drained Hartleton soils. The included soils make up as much as 20 percent of this map unit.

Permeability is slow or moderately slow in the subsoil of the Wharton soil. Available water capacity is moderate. Runoff is medium. The seasonal high water table restricts root growth during wet periods. In unlimed areas the soil is strongly acid or very strongly acid in the surface layer and subsoil and strongly acid to extremely acid in the substratum. Erosion is a moderate hazard.

Most areas of this soil are used as woodland. A few areas are used for cultivated crops or pasture.

This soil is suited to cultivated crops. Erosion is a moderate hazard. Contour stripcropping, conservation tillage, diversion terraces, and grassed waterways help to reduce the runoff rate and control erosion. Cover crops, crop residue on the surface, and a cropping system that includes hay help to maintain the organic matter content and good tilth. Installing surface and subsurface drains in wet areas will allow for timely tillage and harvesting.

This soil is suited to pasture. Grazing when the soil is wet compacts the surface layer. It is the major management concern. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table restricts the use of equipment during wet periods, but machine planting generally is practical. Constructing logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the moderately slow or slow permeability. Specially designed systems of onsite waste disposal are needed on this soil. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IIIe; the woodland ordination symbol is 4R.

WaD—Wharton silt loam, 15 to 25 percent slopes. This is a moderately steep, deep, moderately well drained soil on hilltops and benches. Slopes are slightly concave and are about 100 to 400 feet long. Areas generally are oblong or oval and are 4 to 60 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 37 inches thick. The upper part is yellowish brown silty clay loam to a depth of about 20 inches. The lower part is yellowish brown channery silty clay loam to a depth of about 44 inches. The substratum is light yellowish brown, mottled very channery silty clay loam to a depth of about 56 inches. Siltstone and shale are at a depth of 56 inches.

Included with this soil in mapping are some small areas of the deep, somewhat poorly drained Cavode soils, the very deep, moderately well drained Buchanan soils, and the deep, well drained Hartleton soils. The included soils make up as much as 20 percent of this map unit.

Permeability is slow or moderately slow in the subsoil of the Wharton soil. Available water capacity is moderate. Runoff is rapid. The seasonal high water table restricts root growth during wet periods. In unlimed areas the soil is strongly acid or very strongly acid in the surface layer and subsoil and strongly acid to extremely acid in the substratum. Erosion is a severe hazard.

Most areas of this soil are used as woodland. A few areas are used for cultivated crops or pasture.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, diversion terraces, and grassed waterways help to reduce the runoff rate and control erosion. Cover crops, crop residue on the surface, and a cropping system that includes hay help to maintain the organic matter content and good tilth. Installing surface and subsurface drains in wet areas will allow for timely tillage and harvesting.

This soil is suited to pasture. Grazing when the soil is wet compacts the surface layer. It is the major management concern. Proper stocking rates help to maintain the key plant species and in combination with rotation grazing, timely deferment of grazing, and restricted grazing during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table restricts the use of equipment during wet periods, but machine planting generally is practical. Constructing logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the moderately slow or slow permeability. Specially designed systems of onsite waste disposal are needed on this soil.

Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is IVe; the woodland ordination symbol is 4R.

WxB—Wharton silt loam, 0 to 8 percent slopes, very stony. This is a nearly level and gently sloping, deep, moderately well drained soil on hilltops and benches. Slopes are slightly concave and are about 100 to 400 feet long. Areas generally are oblong or oval and are 4 to 40 acres in size. Stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 37 inches thick. The upper part is yellowish brown silty clay loam to a depth of about 20 inches. The lower part is yellowish brown channery silty clay loam to a depth of about 44 inches. The substratum is light yellowish brown, mottled very channery silty clay loam to a depth of about 56 inches. Siltstone and shale are at a depth of 56 inches.

Included with this soil in mapping are some small areas of the deep, somewhat poorly drained Cavode soils, the very deep, moderately well drained Buchanan soils, and the deep, well drained Hartleton soils. The included soils make up as much as 20 percent of this map unit.

Permeability is slow or moderately slow in the subsoil of the Wharton soil. Available water capacity is moderate. Runoff is medium. The seasonal high water table restricts root growth during wet periods. In unlimed areas the soil is strongly acid or very strongly acid in the surface layer and subsoil and strongly acid to extremely acid in the substratum. Erosion is a severe hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table restricts the use of equipment during wet periods, but machine planting generally is practical. Constructing logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the moderately slow or slow permeability. Specially designed systems of onsite waste disposal are needed on this soil. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is VIs; the woodland ordination symbol is 4A.

WxD—Wharton silt loam, 8 to 25 percent slopes, very stony. This is a sloping and moderately steep, deep, moderately well drained soil on hilltops and benches. Slopes are slightly concave and are about 100 to 400 feet long. Areas generally are oblong or oval and are 5 to 60 acres in size. Stones 1 foot to several feet in diameter cover about 0.1 to 3.0 percent of the surface.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 37 inches thick. The upper part is yellowish brown silty clay loam to a depth of about 20 inches. The lower part is yellowish brown channery silty clay loam to a depth of about 44 inches. The substratum is light yellowish brown, mottled very channery silty clay loam to a depth of about 56 inches. Siltstone and shale are at a depth of 56 inches.

Included with this soil in mapping are some small areas of the deep, somewhat poorly drained Cavode soils, the very deep, moderately well drained Buchanan soils, and the deep, well drained Hartleton soils. The included soils make up as much as 20 percent of this map unit.

Permeability is slow or moderately slow in the subsoil of the Wharton soil. Available water capacity is moderate. Runoff is medium or rapid. The seasonal high water table restricts root growth during wet periods. In unlimed areas the soil is strongly acid or very strongly acid in the surface layer and subsoil and strongly acid to extremely acid in the substratum. Erosion is a severe hazard.

Most areas are used as woodland. This soil is unsuited to cultivated crops and poorly suited to improved pasture because of numerous stones on the surface.

This soil is suited to trees. The potential productivity for northern red oak is moderately high. The seasonal high water table restricts the use of equipment during wet periods, but machine planting generally is practical. Constructing logging roads on the contour helps to control erosion. Removing undesirable trees helps to increase timber production.

The limitations affecting onsite waste disposal, dwellings with basements, and most other urban uses are the seasonal high water table and the moderately slow or slow permeability. Specially designed systems of onsite waste disposal will work on this soil. Installing foundation drains with proper outlets will reduce wetness around basements.

The capability subclass is VIs; the woodland ordination symbol is 4R.

Prime Farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. Identification of prime farmland is a major step in meeting the Nation's needs for food and fiber.

The U.S. Department of Agriculture defines prime farmland as the land that is best suited to food, feed, forage, fiber, and oilseed crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields and requires minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

An area identified as prime farmland must be used for food or fiber or must be available for those uses. Thus, urban or built-up land and water areas are not classified as prime farmland.

The general criteria for prime farmland are as follows: a generally adequate and dependable supply of moisture from precipitation or irrigation, favorable temperature and growing-season length, acceptable levels of acidity or alkalinity, few or no rocks, and permeability to air and water. Prime farmland is not excessively erodible, is not saturated for long periods, and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

The survey area has about 138,937 acres of prime farmland. That acreage makes up about 18 percent of the total acreage in the survey area.

The map units that are considered prime farmland in the survey area are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4, and the location of each unit is shown on the detailed soil maps at the back of this publication. The soil properties and characteristics that affect use and management of the units are described in the section "Detailed Soil Map Units."

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

John C. Spitzer, conservation agronomist, Soil Conservation Service, helped prepare this section.

The major management concerns on the cropland and pasture in the survey area are described in this section. The crops or pasture plants best suited to the soils in the survey area, including some that are not commonly grown, are identified. The land capability classification system of the Soil Conservation Service is explained, and the predicted yields of the main crops and hay and pasture plants are listed for each soil.

This section provides information about the overall agricultural potential and management needed in the survey area. This information is useful to agribusinesses, equipment dealers, drainage contractors, fertilizer companies, processing companies, planners, conservationists, and others. Information about management of each kind of soil is given in the section "Detailed Soil Map Units." When management systems for individual fields or farms are planned, the detailed information given in the description of each soil should be used.

In 1975, cropland and pasture made up 19,662 acres in Elk County and 1,964 acres in Cameron County, according to the "Conservation Needs Inventory." Most of this acreage was used as permanent or rotation hayland or pasture.

Food production can be increased considerably if the latest crop production technology is extended to all of the cropland in the counties. This soil survey can greatly facilitate the application of such technology.

Water erosion is the major management concern on most of the cropland and pasture in Elk and Cameron Counties. Wharton and Hartleton soils are potentially productive for crops and pasture. In areas where the slope is more than 3 percent, however, the hazard of erosion is moderate or severe.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and as part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a layer in or below the subsoil that limits the depth of the root zone. In Albrights and Buchanan soils, for example, a moderate depth to a fragipan limits the rooting depth. Erosion also reduces the productivity of soils that tend to be droughty, such as Wharton soils.

Second, erosion on farmland can result in the pollution of streams and reservoirs through sediment deposition. Controlling erosion minimizes this pollution

and helps to maintain the quality of water for municipal use, recreation, and fish and wildlife.

In many sloping fields in areas of channery soils, preparing a good seedbed and tilling are difficult because erosion has removed the original surface soil, leaving many areas where numerous coarse fragments are on the surface. Such areas are common on the steeper Hazleton and Leck Kill soils. Controlling erosion protects the surface, reduces the runoff rate, and increases the rate of water infiltration. A cropping system that keeps a vegetative cover on the soil for extended periods will minimize soil losses.

On livestock farms, which require pasture and hay, forage crops of grasses and legumes are included in the cropping system. These crops help to control erosion on sloping land, provide nutrients to the soil, and improve soil tilth.

Contour farming and stripcropping are common erosion-control practices in the survey area. They are best suited to soils that have smooth, uniform slopes. These soils include most areas of the sloping Hazleton, Hartleton, Albrights, Cookport, and Buchanan soils. In some areas of these soils, however, slopes are irregular and farming on the contour or terracing is impractical. On these irregularly sloping soils, cropping systems that provide a substantial vegetative cover help to control erosion. Conservation tillage provides additional protection against erosion. Minimum tillage, cover crops, and crop residue on the surface increase the rate of water infiltration and help to control erosion. These practices can be used on most of the soils in the survey area. No-till farming is effective in controlling erosion in sloping areas used for corn. It is suitable on most of the soils in the survey area, except for those that are poorly drained or very poorly drained.

Diversions reduce the length of slopes and thus help to control erosion. They are most practical on deep, well drained soils that have regular slopes, such as Albrights and Buchanan soils. Diversions are less effective in areas that have irregular slopes, excessively wet diversion channels, or bedrock within a depth of 40 inches.

Information about the design of erosion-control practices for each kind of soil is contained in the Technical Guide, which is available in local offices of the Soil Conservation Service.

Soil drainage is the major management concern on about 3,047 acres of cropland and pasture in Elk County and 220 acres in Cameron County. Some soils are naturally so wet that production of the crops or pasture plants commonly grown the survey area generally is not possible unless a drainage system is installed. Examples are the poorly drained Atkins and Brinkerton soils.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface drains and tile drainage is needed in most areas of the poorly drained soils used for the more intensive cropping systems. Drains should be more closely spaced in slowly permeable soils than in the more rapidly permeable soils. In areas of Atkins soils, adequate outlets for drainage systems generally are not readily available.

Fertility is naturally low in some of the soils in the survey area. Many soils on uplands are naturally strongly acid. On these soils applications of ground limestone will supply calcium and raise the pH sufficiently for alfalfa and other crops to grow well. Available phosphorus and magnesium levels are naturally low in most of the soils. Additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of lime and fertilizer to be applied.

Soil tilth is an important factor affecting the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous.

Some areas in the two counties can be used for specialty crops. The best combination of soil properties and air drainage for fruits and vegetables is in areas of Hazleton soils. Philo and Pope soils also can be used for vegetables, but in some years flooding causes crop damage. In areas used for low-residue vegetable crops, cover crops or a crop rotation that includes high-residue crops can help to control erosion and maintain the content of organic matter.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable

soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops *(15)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

William H. Clifton, forester, Soil Conservation Service, helped prepare this section.

Forest land makes up about 723,700 acres in the two counties *(18)*. It makes up about 250,800 acres in Cameron County and 472,900 acres in Elk County. Of the forest land in both counties, 46 percent (43 percent in Cameron County and 47 percent in Elk County) is privately owned. Of the 702,900 acres of commercial forest land in the counties, 54 percent (47 percent in Cameron County and 53 percent in Elk County) is publicly owned *(16)*. Noncommercial forest land makes up 3 percent (4 percent in Cameron County and 2 percent in Elk County) of the survey area.

Stands of second- and third-growth trees make up the forest land. Based on data from the United States Department of Agriculture, Forest Service, and the Pennsylvania Bureau of Forestry, the composition and extent of the major forest types are estimated as follows.

The softwood type makes up 3 percent of the commercial forest land (0.5 percent in Cameron County

and 4 percent in Elk County). It consists of both the white pine-hemlock type and the mixed pine type. The white pine-hemlock type is commonly associated with red maple, red oak, white oak, beech, black cherry, and aspen. The mixed pine type is commonly associated with red pine, pitch pine, white pine, spruce, and mixed hardwoods resulting from the replanting of nonforested areas.

The oak type makes up 23 percent (21 percent in Cameron County and 25 percent in Elk County) of the commercial forest land *(12)*. It consists of both the oak-pine and oak-hickory types. The oak-pine type is commonly associated with red maple, black cherry, and hickory. The oak-hickory type is commonly associated with white ash, sweet birch, black cherry, sugar maple, red maple, yellow poplar, and pitch pine.

The Allegheny hardwood type makes up 74 percent (79 percent in Cameron County and 71 percent in Elk County) of the commercial forest land *(12)*. This type consists mainly of sugar maple, beech, yellow birch, black cherry, and red maple. It is commonly associated with sweet birch, white ash, northern red oak, yellow poplar, aspen, white oak, hickory, basswood, hemlock, and white pine.

Stands of sawtimber make up about 50 percent of the commercial forest land (50 percent in each county). Stands of poletimber make up 40 percent (46 percent in Cameron County and 37 percent in Elk County). The remaining 10 percent (4 percent in Cameron County and 13 percent in Elk County) is stands of seedlings and saplings and areas where less than 10 percent of the stand is stocked with growing trees.

Generally, the soils in the counties can support good stands of red oak, sugar maple, black cherry, and white pine. Trees grow better on the deeper, well drained soils than on the shallow, poorly drained soils.

Good management can encourage the growth of desirable trees. The existing stands in the survey area commonly have too many trees per acre for the best tree growth and stand development. Favoring the tree species that are of higher economic value or that have greater potential for yielding a high volume of wood will improve the commercial value of the forest. Further, the landowner can favor the species that best meets the desired objectives. A forester can provide professional assistance in a forest improvement program.

Cameron and Elk Counties have an ideal climate for the production of maple syrup. Poletimber-size sugar maples are dominant on the deep, well drained and moderately well drained soils. Sugar bushes can be established on these soils.

The forest land in Cameron and Elk Counties provides watershed protection, opportunities for recreation, wildlife habitat, esthetic values, and commercial wood crops. The better sites require protection from fire, disease, insects, livestock grazing, and accelerated erosion.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed in the tables. The table gives the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, that the indicator species can produce *(11)*. The larger the number, the greater the potential productivity. The number 1 indicates low productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 or more, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation for use and management. The letter *R* indicates steep slopes; *X*, stones or rocks on the surface; *W*, excess water in or on the soil; *T*, acidity; *D*, restricted rooting depth caused by bedrock, a hardpan, or other restrictive layers; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, high content of rock fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that erosion can occur as a result of site preparation or cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope and on the erosion factor K shown in table 16. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities. The proper construction and maintenance of roads, trails, landings, and fire lanes will reduce the erosion hazard.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the

surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months. Choosing the best suited equipment and deferring the use of harvesting and other equipment during wet periods help to overcome the equipment limitation.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and aspect of the slope. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. The expected mortality is less than 25 percent. A rating of *moderate* indicates that the expected mortality is 25 to 50 percent. Extra precautions are advisable. A rating of *severe* indicates that the expected mortality is more than 50 percent. Extra precautions are important. Replanting may be necessary. Selection of special planting stock and special site preparation, such as bedding, furrowing, and a surface drainage system, can reduce the seedling mortality rate.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees but do not uproot them. A rating of *moderate* indicates that a few trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates many trees can be blown down during these periods. The use of special equipment that does not damage surficial root systems during partial cutting operations can reduce the hazard of windthrow. Care in thinning or not thinning at all also can reduce the hazard.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands *(11)*. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *productivity class*, a number, represents an expected volume produced by the most important trees. This number, expressed as cubic meters per hectare per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand *(11)*. One cubic meter per hectare equals 14.3 cubic feet per acre.

The first species listed under *common trees* for a soil is the indicator species for that soil. This species is common in the survey area. It generally is the most productive species on the soil. The productivity class of the indicator species is the number in the ordination symbol.

Trees to plant are those that are suitable for commercial wood production on the soil.

Recreation

The vast tracts of woodland and abundant wildlife in Cameron and Elk Counties provide opportunities for recreational activities, including hunting. The counties have many hunting lodges (fig. 9).

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil

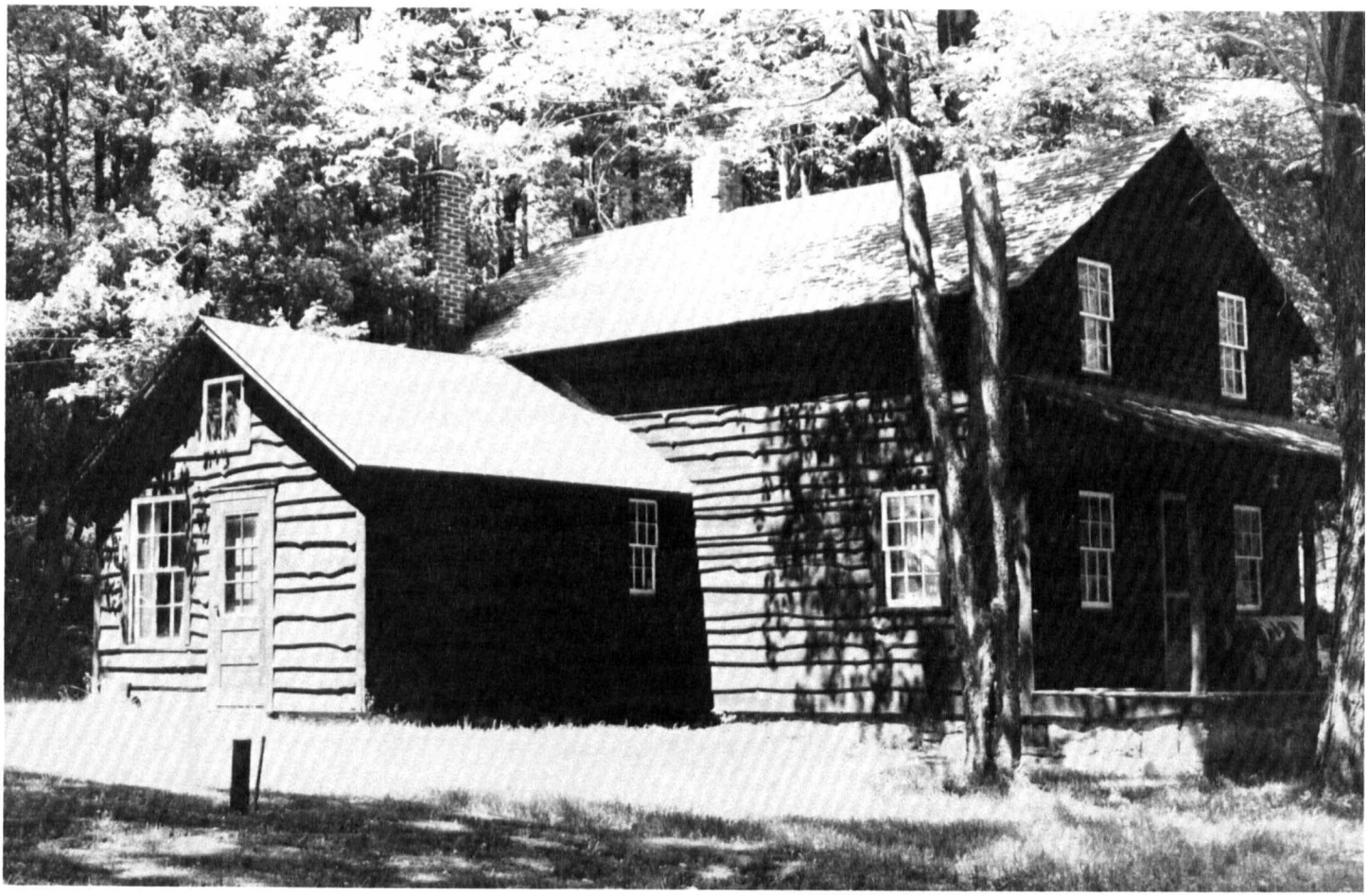

Figure 9.—A hunting lodge in a wooded area of Hartleton channery silt loam, 3 to 8 percent slopes.

properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have

moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover *(1)*. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggartick, quackgrass, and ragweed.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, birch, cherry, maple, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are silky dogwood, American hazel, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, yew, cedar, and hemlock.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, arrowhead, wild millet, cattail, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, swamps, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of

the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost-action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table,

depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed

only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the Unified soil classification system *(3)* and the system adopted by the American Association of State Highway and Transportation Officials *(2)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3

inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓ bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil

to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

Soils in table 17 may be assigned to two hydrologic soil groups. Dual grouping is used for one of two reasons. Some soils have a seasonal high water table but can be drained. In this instance the first letter is for drained areas and the second is for undrained areas. For some soils that are less than 20 inches deep over bedrock, the first letter is for areas where the bedrock is cracked and pervious and the second is for areas where the bedrock is impervious or where exposed bedrock makes up more than 25 percent of the surface.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months.

The information on flooding is based on evidence in the soil profile, namely, thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that are characteristic of soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely, grayish colors or mottles in the

soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(17)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements *(5)*. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent *(Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Fluvaquents *(Fluv*, meaning river, plus *aquent*, the suborder of the Entisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, acid, mesic Typic Fluvaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(14)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(17)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Albrights Series

The soils of the Albrights series are fine-loamy, mixed, mesic Aquic Fragiudalfs. These soils are very deep and are moderately well drained and somewhat

poorly drained. They are on uplands. They formed in colluvium derived from red shale and sandstone. Slope ranges from 3 to 25 percent.

Albrights soils are adjacent to the deep, well drained Leck Kill soils, the very deep, well drained Barbour soils, and the very deep, moderately well drained Basher soils.

Typical pedon of Albrights silt loam, 8 to 15 percent slopes, in Shippen Township, Cameron County; 3.6 miles south of Truman, State Game Lands Number 14, about 350 feet south of West Branch Hicks Run and 2,100 feet east of gasline, in an area of woodland:

Oi—2 inches to 1 inch; forest litter.
Oe—1 inch to 0; black (10YR 2/1), decomposed organic matter.
A—0 to 4 inches; dark reddish brown (5YR 3/2) silt loam; weak fine and medium granular structure; friable, nonsticky and nonplastic; many fine to coarse roots; 10 percent rock fragments; strongly acid; clear wavy boundary.
AB—4 to 8 inches; reddish brown (5YR 4/3) silt loam; weak medium granular structure; friable, slightly sticky and slightly plastic; common fine to coarse roots; 5 percent rock fragments; strongly acid; clear wavy boundary.
Bt—8 to 20 inches; reddish brown (5YR 4/4) silt loam; few faint reddish gray (5YR 5/2) mottles in the lower part; moderate coarse blocky structure; friable, slightly sticky and slightly plastic; common distinct clay films on faces of peds; few medium and coarse roots; 10 percent rock fragments; strongly acid; clear wavy boundary.
Btx—20 to 40 inches; reddish brown (5YR 5/3) clay loam; many medium and coarse distinct pinkish gray (5YR 6/2) and yellowish red (5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak thick platy; very firm and brittle, slightly sticky and slightly plastic; many prominent clay films on faces of prisms and plates; few fine roots between prisms and plate faces; 10 percent rock fragments; strongly acid; gradual irregular boundary.
C—40 to 66 inches; reddish brown (5YR 4/3) channery clay loam; many coarse distinct pinkish gray (5YR 6/2) and yellowish red (5YR 5/6) mottles; massive; firm, slightly sticky and slightly plastic; 25 percent rock fragments; strongly acid.

The solum ranges from 40 to 65 inches in thickness. The depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 18 to 30 inches. Depth to low-chroma mottles ranges from 12 to 20 inches. Rock fragments make up 5 to 30 percent of the upper part of the B horizon, 10 to 50 percent of the lower part of the B horizon, and 25 to 75 percent of the C horizon. In unlimed areas reaction ranges from extremely acid to strongly acid in the upper part of the solum and is very strongly acid or strongly acid in the lower part of the C horizon.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 3 to 6. The fine-earth texture ranges from silt loam to clay loam.

The Bx horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 2 to 6. The fine-earth texture ranges from loam to clay loam.

The C horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 2 to 6. The fine-earth texture ranges from loam to clay loam.

Atkins Series

The soils of the Atkins series are fine-loamy, mixed, mesic Typic Fluvaquents. These soils are very deep and poorly drained. They are on flood plains. They formed in alluvium derived from sandstone, siltstone, and shale. Slope is 0 to 3 percent.

Atkins soils are adjacent to the very deep, well drained Pope and Barbour soils and the very deep, moderately well drained Philo and Basher soils.

Typical pedon of Atkins silt loam, in Jones Township, Elk County; about 2 miles southwest of Glen Hazel, 600 feet south of Baltimore and Ohio Railroad track, and 100 feet north of the East Branch of the Clarion River, in an area of woodland:

Oi—2 inches to 1 inch; forest litter.
Oe—1 inch to 0; decomposed organic matter.
A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; many fine to coarse roots; very strongly acid; clear wavy boundary.
Ag—4 to 9 inches; gray (10YR 5/1) silt loam; common fine and medium distinct strong brown (7.5YR 5/8) mottles; weak fine and medium granular structure; friable; many fine to coarse roots; very strongly acid; clear wavy boundary.
Bg1—9 to 18 inches; gray (10YR 5/1) silt loam; many medium distinct strong brown (7.5YR 5/8) and yellowish red (5YR 5/6) mottles; weak medium subangular blocky structure; friable; common medium to coarse roots; very strongly acid; clear wavy boundary.
Bg2—18 to 36 inches; gray (10YR 5/1) silt loam; many coarse prominent strong brown (7.5YR 5/8) and yellowish red (5YR 5/8) mottles; weak medium and coarse subangular blocky structure; friable; few

coarse roots; very few black coatings; 10 percent rock fragments; very strongly acid; gradual wavy boundary.
Cg—36 to 64 inches; gray (10YR 5/1) channery loam; many coarse prominent strong brown (7.5YR 5/8) and yellowish red (5YR 5/8) mottles; massive; firm; few black coatings; 15 percent rock fragments; very strongly acid.

The solum ranges from 30 to 50 inches in thickness. The depth to bedrock is more than 60 inches. Rock fragments make up 0 to 20 percent of the solum and 0 to 30 percent of the C horizon. In unlimed areas reaction is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2. Mottles in this horizon have hue of 5YR to 10YR, value of 4 or 5, and chroma of 4 to 8.

The B horizon is neutral in hue or has hue of 10YR to 5Y. It has value of 5 to 7 and chroma of 0 to 2. Mottles in this horizon have hue of 5YR to 2.5Y, value of 3 to 6, and chroma of 2 to 8. The fine-earth texture is silty clay loam, clay loam, silt loam, or loam.

The C horizon is neutral in hue or has hue of 10YR to 5Y. It has value of 5 or 6 and chroma of 0 to 6. The fine-earth texture is mainly silty clay loam, silt loam, loam, or sandy loam. Some pedons have a 2C horizon of sand and gravel below a depth of 36 inches.

Barbour Series

The soils of the Barbour series are coarse-loamy over sandy or sandy-skeletal, mixed, mesic Fluventic Dystrochrepts. These soils are very deep and well drained. They are on flood plains. They formed in alluvium derived from red sandstone and shale. Slope is 0 to 3 percent.

Barbour soils are adjacent to the very deep, poorly drained Atkins soils and the very deep, moderately well drained Basher soils.

Typical pedon of Barbour fine sandy loam, in Gibson Township, Cameron County; 0.2 mile south of Sterling Run and 150 feet west of Pennsylvania Route 120, in a cultivated field:

Ap—0 to 7 inches; dark brown (7.5YR 3/2) fine sandy loam; weak fine granular structure; very friable; common fine roots; strongly acid; abrupt smooth boundary.
Bw1—7 to 12 inches; brown (7.5YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; few fine roots; strongly acid; clear wavy boundary.
Bw2—12 to 30 inches; brown (7.5YR 4/4) fine sandy loam; weak fine subangular blocky structure; very friable; few fine roots; 10 percent rock fragments; strongly acid; clear wavy boundary.
2C1—30 to 48 inches; reddish brown (5YR 4/4) very channery loamy sand; single grain; loose; 45 percent rock fragments; strongly acid; gradual irregular boundary.
2C2—48 to 66 inches; reddish brown (5YR 4/4) very channery loamy sand; single grain; loose; 60 percent rock fragments; strongly acid.

The solum ranges from 18 to 40 inches in thickness. The depth to bedrock is more than 60 inches. The 2C horizon is at a depth of 20 to 40 inches. Rock fragments make up 0 to 30 percent of the solum and 35 to 60 percent of the C horizon. In unlimed areas reaction ranges from medium acid to very strongly acid.

The Ap horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4.

The B horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The fine-earth texture is fine sandy loam, loam, or silt loam.

The C horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. The fine-earth texture is sandy loam, fine sandy loam, loam, or silt loam.

The 2C horizon has hue of 5YR or 7.5YR, value of 4, and chroma of 2 to 4. The fine-earth texture ranges from loamy sand to sandy loam.

Basher Series

The soils of the Basher series are coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts. These soils are very deep and moderately well drained. They are on flood plains. They formed in alluvium derived from red sandstone and shale. Slope is 0 to 3 percent.

Basher soils are adjacent to the very deep, well drained Barbour soils and the very deep, poorly drained Atkins soils.

Typical pedon of Basher silt loam, in Shippen Township, Cameron County; 1.6 miles west of Lockwood, about 3,000 feet west on County Route 12012 from the intersection of County Routes 12003 and 12012, about 300 feet south of Clear Creek, in a cultivated field:

Ap—0 to 8 inches; dark brown (7.5YR 3/2) silt loam; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear smooth boundary.
Bw1—8 to 15 inches; reddish brown (5YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable; common fine and medium roots; strongly acid; clear wavy boundary.
Bw2—15 to 22 inches; reddish brown (5YR 4/3) fine sandy loam; common fine and medium distinct

reddish gray (5YR 5/2) mottles; weak medium subangular blocky structure; friable; few fine roots; strongly acid; clear wavy boundary.

BC—22 to 30 inches; reddish brown (5YR 5/4) fine sandy loam; common medium distinct grayish brown (10YR 5/2) and yellowish red (5YR 5/8) mottles; weak fine and medium subangular blocky structure; friable; few fine roots; strongly acid; clear wavy boundary.

C1—30 to 42 inches; grayish brown (10YR 5/2) fine sandy loam; common medium distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; single grain; loose, very friable; 5 percent rock fragments; strongly acid; clear wavy boundary.

2C2—42 to 66 inches; light gray (10YR 7/2) gravelly loamy sand; common medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; single grain; loose, very friable; 20 percent rock fragments; strongly acid.

The solum ranges from 16 to 40 inches in thickness. Depth to the 2C horizon is 40 inches or more. The depth to bedrock is more than 60 inches. Rock fragments make up 0 to 20 percent of the solum and 20 to 60 percent of the C horizon. In unlimed areas reaction is strongly acid or very strongly acid.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4.

The B horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 3 to 6. Mottles in this horizon have hue of 2.5YR to 10YR. They have chroma of mainly 2 to 8, but in some pedons they have chroma of 0 or 1 within a depth of 24 inches. The fine-earth texture is silt loam, loam, or fine sandy loam.

The C horizon has hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 2 to 4. The fine-earth texture is silt loam, loam, fine sandy loam, or loamy sand.

Brinkerton Series

The soils of the Brinkerton series are fine-silty, mixed, mesic Typic Fragiaqualfs. These soils are very deep and poorly drained. They are on uplands. They formed in colluvium derived from siltstone and shale. Slope ranges from 0 to 8 percent.

Brinkerton soils are adjacent to the very deep, moderately well drained Philo and Buchanan soils, the deep, moderately well drained Wharton soils, and the deep, somewhat poorly drained Cavode soils.

Typical pedon of Brinkerton silt loam, 0 to 3 percent slopes, in Fox Township, Elk County; east of Kersey Village, approximately 300 feet southeast of the intersection of Pennsylvania Route 948 and Township Route 394, in an area of woodland:

Oi—3 to 2 inches; leaf litter.

Oe—2 inches to 0; black (2.5Y 2/0), decomposed organic matter.

A—0 to 6 inches; very dark gray (10YR 3/1) silt loam; weak fine granular structure; friable; many fine to coarse roots; strongly acid; abrupt smooth boundary.

Btg1—6 to 14 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine faint and distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; moderate fine and medium blocky structure; friable; common fine roots; few distinct clay films on faces of peds; strongly acid; gradual wavy boundary.

Btg2—14 to 24 inches; light brownish gray (2.5Y 6/2) silty clay loam; many medium distinct gray (N 6/0) and strong brown (7.5YR 5/6) mottles; moderate medium blocky structure; firm; few fine roots; 5 percent rock fragments; common distinct clay films on faces of peds and in pores; strongly acid; gradual wavy boundary.

Btxg1—24 to 30 inches; grayish brown (2.5Y 5/2) channery silt loam; many fine and medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure parting to moderate thin platy and moderate medium angular blocky; firm and brittle; 20 percent rock fragments; very few prominent black coatings; common distinct clay films on faces of peds and in pores; strongly acid; clear wavy boundary.

Btxg2—30 to 42 inches; grayish brown (2.5Y 5/2) channery silt loam; many fine and medium prominent yellowish red (5YR 4/6) mottles; gray (5Y 5/1) prism faces; moderate very coarse prismatic structure parting to moderate thick platy and moderate medium blocky; firm and brittle; 15 percent rock fragments; few prominent black coatings; common distinct clay films on faces of peds, in pores, and on many prominent faces of prisms; strongly acid; clear wavy boundary.

Btxg3—42 to 50 inches; grayish brown (10YR 5/2) channery silt loam; common medium faint grayish brown (2.5Y 5/2) mottles; weak very coarse prismatic structure; firm and brittle; 20 percent rock fragments; common prominent clay films on faces of prisms; strongly acid; clear wavy boundary.

Cg—50 to 96 inches; grayish brown (2.5Y 5/2) silt loam; massive; 10 percent rock fragments; strongly acid.

The solum ranges from 40 to 50 inches in thickness. The depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 15 to 30 inches. Rock

fragments make up 0 to 5 percent of the part of the solum above the Bx horizon, 0 to 20 percent of the Bx horizon, and 10 to 35 percent of the C horizon. In unlimed areas reaction is strongly acid or very strongly acid in the A and B horizons and strongly acid or medium acid in the C horizon.

The A horizon has hue of 10YR to 2.5Y, value of 3 or 4, and chroma of 1 to 3.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The fine-earth texture is silty clay loam or silt loam.

The Bx horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 5 or 6 and chroma of 0 to 2. The fine-earth texture is silty clay loam, silt loam, or loam.

The C horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 4 or 5 and chroma of 0 to 4. The fine-earth texture is silty clay loam, silt loam, or loam.

Buchanan Series

The soils of the Buchanan series are fine-loamy, mixed, mesic Aquic Fragiudults. These soils are very deep and moderately well drained. They are on uplands. They formed in colluvium derived from sandstone, siltstone, and shale. Slope ranges from 3 to 25 percent.

Buchanan soils are adjacent to the deep, well drained Hartleton and Hazleton soils, the deep, moderately well drained Wharton soils, and the deep, somewhat poorly drained Cavode soils.

Typical pedon of Buchanan silt loam, 3 to 8 percent slopes, in Ridgway Township, Elk County; from Pennsylvania Route 948 and County Route 24007, about 0.5 mile northeast of County Route 24007 and 200 feet east of County Route 24007, in an area of woodland:

Oi—2 inches to 1 inch; forest litter.

Oe—1 inch to 0; black, decomposed organic matter.

A—0 to 3 inches; very dark gray (10YR 3/1) silt loam; weak fine granular structure; friable, slightly sticky and slightly plastic; many fine to coarse roots; 5 percent rock fragments; very strongly acid; abrupt smooth boundary.

E—3 to 10 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine and medium granular structure; friable, slightly sticky and slightly plastic; common fine and medium roots; 5 percent rock fragments; strongly acid; clear smooth boundary.

Bw—10 to 17 inches; yellowish brown (10YR 5/6) silt loam; weak fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; few fine and medium roots; 5 percent rock fragments; strongly acid; clear wavy boundary.

Bt—17 to 25 inches; yellowish brown (10YR 5/4) silt loam; common medium faint light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; moderate fine and medium subangular blocky structure; friable, sticky and plastic; common distinct clay films on faces of peds; few fine and medium roots; 5 percent rock fragments; strongly acid; clear wavy boundary.

Btx—25 to 40 inches; brown (7.5YR 4/4) channery loam; common medium distinct light brownish gray (10YR 6/2) and yellowish red (5YR 4/8) mottles; strong very coarse prismatic structure parting to moderate very thick platy; firm and brittle, slightly sticky and slightly plastic; many prominent clay films on faces of prisms and many distinct coatings on faces of plates; few prominent black coatings on faces of prisms and plates; 20 percent rock fragments; strongly acid; clear wavy boundary.

C—40 to 66 inches; brown (7.5YR 5/4) channery loam; common medium distinct light brownish gray (10YR 6/2) and yellowish red (5YR 4/8) mottles; massive; firm, slightly sticky and slightly plastic; 30 percent rock fragments; strongly acid.

The solum ranges from 40 to 60 inches in thickness. The depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 20 to 30 inches. Rock fragments make up 5 to 50 percent of the profile. In unlimed areas reaction is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 4.

The E horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. The fine-earth texture is silt loam or loam.

The Bt horizon has hue of 7.5YR, value of 4 to 6, and chroma of 3 to 6. The fine-earth texture is loam, silt loam, clay loam, or sandy clay loam.

The Bx horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. The fine-earth texture is loam, silt loam, or clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6. The fine-earth texture is silt loam, loam, sandy clay loam, or clay loam.

Cavode Series

The soils of the Cavode series are clayey, mixed, mesic Aeric Ochraquults. These soils are deep and somewhat poorly drained. They are on uplands. They formed in residuum of shale and siltstone. Slope ranges from 0 to 25 percent.

Cavode soils are adjacent to the deep, well drained Hartleton soils, the very deep, moderately well drained

Buchanan soils, and the deep, moderately well drained Wharton soils.

Typical pedon of Cavode silt loam, 3 to 8 percent slopes, in Benzinger Township, Elk County; about 3 miles northeast of St. Marys, 2,050 feet northwest of the intersection of Pennsylvania Route 120 and Township Route 397, in an area of woodland:

Oi—2 inches to 1 inch; forest litter.
Oe—1 inch to 0; black, decomposed organic matter.
A—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable; many fine to coarse roots; 10 percent rock fragments; very strongly acid; abrupt smooth boundary.
Bt1—8 to 14 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; common fine roots; 5 percent rock fragments; common distinct clay films on faces of peds; very strongly acid; clear wavy boundary.
Bt2—14 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; moderate medium blocky structure; firm; few fine roots; 5 percent rock fragments; very few prominent black coatings on faces of peds; many distinct clay films on faces of peds; very strongly acid; clear wavy boundary.
Btg—26 to 36 inches; grayish brown (10YR 5/2) channery silty clay loam; many medium distinct brown (7.5YR 5/2 and 4/4) and grayish brown (2.5Y 5/2) mottles; moderate medium angular blocky; firm; few fine roots; 15 percent rock fragments; few prominent black coatings on faces of peds; common distinct clay films on faces of peds and in pores; very strongly acid; clear wavy boundary.
BCtg—36 to 44 inches; grayish brown (10YR 5/2) channery silty clay loam; many medium and coarse distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; weak coarse angular blocky structure; firm; few very fine roots; 25 percent rock fragments; few prominent black coatings on faces of peds; few distinct clay films on faces of peds; very strongly acid; clear wavy boundary.
Cg—44 to 58 inches; grayish brown (2.5Y 5/2) channery silty clay loam; many coarse distinct brown (10YR 5/3 and 7.5YR 5/4) mottles; massive; firm; 30 percent rock fragments; strongly acid; clear wavy boundary.
R—58 inches; brownish gray shale.

The solum ranges from 30 to 60 inches in thickness. The depth to bedrock ranges from 40 to 60 inches. Rock fragments make up 0 to 15 percent of the A and Bt horizons and 10 to 60 percent of the BC and C horizons. The Bt horizon is 35 to 45 percent clay and 35 to 60 percent silt. In unlimed areas reaction is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The upper part of the B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. The lower part has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. The fine-earth texture of this horizon is silty clay loam or silty clay.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. The fine-earth texture is silty clay loam, silty clay, or clay.

Cookport Series

The soils of the Cookport series are fine-loamy, mixed, mesic Aquic Fragiudults. These soils are deep and moderately well drained. They are on uplands. They formed in residuum of sandstone and siltstone. Slope ranges from 0 to 25 percent.

Cookport soils are adjacent to the deep, well drained Hazleton soils and the deep, poorly drained Nolo soils.

Typical pedon of Cookport channery loam, 8 to 25 percent slopes, very stony, in Highland Township, Elk County; 3,000 feet north-northeast of Sackett and the intersection of Township Routes 313 and 458, in an area of woodland:

Oi—2 inches to 1 inch; partly decomposed leaf litter.
Oe—1 inch to 0; black, decomposed organic matter.
A—0 to 2 inches; very dark grayish brown (10YR 3/2) channery loam; weak fine granular structure; friable, nonsticky and nonplastic; many fine to coarse roots; 20 percent rock fragments; very strongly acid; abrupt smooth boundary.
E—2 to 8 inches; brown (10YR 5/3) channery loam; weak fine granular structure; friable, nonsticky and nonplastic; common fine and medium roots; 15 percent rock fragments; very strongly acid; clear wavy boundary.
Bt1—8 to 16 inches; yellowish brown (10YR 5/6) channery loam; moderate medium subangular blocky structure; friable, slightly sticky and nonplastic; few fine and medium roots; common distinct clay films on faces of peds; 15 percent rock fragments; very strongly acid; clear wavy boundary.
Bt2—16 to 23 inches; yellowish brown (10YR 5/6) channery loam; common medium distinct light gray (10YR 7/1) mottles; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; few fine and medium roots; many distinct

clay films on faces of peds; 20 percent rock fragments; very strongly acid; clear smooth boundary.

Btx—23 to 40 inches; yellowish brown (10YR 5/4) channery sandy clay loam; many medium distinct light gray (10YR 7/1) and yellowish red (5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak thick platy; very firm and brittle, slightly sticky and slightly plastic; few fine roots; common distinct clay films on faces of peds; 20 percent rock fragments; very strongly acid; gradual wavy boundary.

C—40 to 46 inches; yellowish brown (10YR 5/4) channery sandy loam; common medium distinct light gray (10YR 7/1) and strong brown (7.5YR 5/8) mottles; firm, nonsticky and nonplastic; 30 percent rock fragments; very strongly acid; gradual wavy boundary.

R—46 inches; grayish brown sandstone.

The solum ranges from 28 to 40 inches in thickness. The depth to bedrock ranges from 40 to 60 inches. The seasonal high water table is at a depth of 12 to 30 inches. Depth to the fragipan ranges from 16 to 27 inches. Rock fragments make up 0 to 30 percent of the solum and 15 to 40 percent of the C horizon. Sand separates make up more than 20 percent of the B and C horizons. In unlimed areas reaction is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. Some pedons have an Ap horizon, which has value of 4 or 5 and chroma of 3 to 6. The fine-earth texture is loam.

The E horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The fine-earth texture is loam or silt loam.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 8. The fine-earth texture is loam, clay loam, sandy loam, or sandy clay loam.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. The fine-earth texture ranges from sandy loam to loam.

Hartleton Series

The soils of the Hartleton series are loamy-skeletal, mixed, mesic Typic Hapludults. These soils are deep and well drained. They are on uplands. They formed in residuum of sandstone and siltstone (fig. 10). Slope ranges from 3 to 60 percent.

Hartleton soils are adjacent to the deep, well drained Hazleton soils, the very deep, moderately well drained Buchanan soils, the deep, moderately well drained Wharton soils, and the deep, somewhat poorly drained Cavode soils.

Figure 10.—Profile of Hartleton channery silt loam, 3 to 8 percent slopes.

Typical pedon of Hartleton channery silt loam, 25 to 60 percent slopes, in Lumber Township, Cameron County, about 3 miles northeast of Cameron; from the intersection of Whitehead Run Road and Hunts Run Road, 1.2 miles east on Whitehead Run Road, then 250 feet southwest, in an area of woodland:

Oi—2 inches to 1 inch; forest litter.

Oe—1 inch to 0; black, decomposed organic matter.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) channery silt loam; weak fine granular structure; very friable, nonsticky and nonplastic; many fine to coarse roots; 30 percent rock fragments; very strongly acid; abrupt smooth boundary.

E—2 to 5 inches; brown (10YR 5/3) channery silt loam; weak fine granular structure; friable, nonsticky and nonplastic; common fine and medium roots; 25 percent rock fragments; very strongly acid; clear smooth boundary.

Bt1—5 to 16 inches; yellowish brown (10YR 5/6) very channery silt loam; weak medium subangular blocky

structure; friable, slightly sticky and slightly plastic; few medium and coarse roots; common faint clay films on faces of peds; 45 percent rock fragments; very strongly acid; clear wavy boundary.

Bt2—16 to 28 inches; yellowish brown (10YR 5/6) very channery silt loam; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; few medium roots; common faint clay films on faces of peds; 55 percent rock fragments; strongly acid; gradual wavy boundary.

BC—28 to 37 inches; yellowish brown (10YR 5/6) extremely channery silt loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; few medium roots; 65 percent rock fragments; strongly acid; gradual wavy boundary.

C—37 to 46 inches; yellowish brown (10YR 5/4) extremely channery loam; single grain; very friable, nonsticky and nonplastic; few fine roots; 80 percent rock fragments; strongly acid; clear wavy boundary.

R—46 inches; grayish brown sandstone.

The solum ranges from 30 to 40 inches in thickness. The depth to bedrock ranges from 40 to 60 inches. The argillic horizon ranges from 12 to 24 inches in thickness. The content of rock fragments ranges from 15 to 40 percent in the A and E horizons, from 25 to 70 percent in the B horizon, and from 50 to 90 percent in the C horizon. In unlimed areas reaction is strongly acid or very strongly acid.

The A horizon has hue of 10YR and value and chroma of 2 to 4.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. The fine-earth texture is silt loam or loam.

The B horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 6. The fine-earth texture is silt loam, loam, or silty clay loam.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6. The fine-earth texture is loam or silt loam.

Hazleton Series

The soils of the Hazleton series are loamy-skeletal, mixed, mesic Typic Dystrochrepts. These soils are deep and well drained. They are on uplands. They formed in residuum of sandstone. Slope ranges from 3 to 60 percent.

Hazleton soils are adjacent to the deep, moderately well drained Cookport soils and the deep, poorly drained Nolo soils.

Typical pedon of Hazleton channery loam, 0 to 8 percent slopes, very stony, in Ridgway Township, Elk County; about 1.5 miles southwest of the intersection of U.S. Route 219 and Pennsylvania Route 948, in an area of woodland:

Oi—2 inches to 1 inch; recent forest litter.

Oe—1 inch to 0; black, decomposed organic matter.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) channery loam; weak fine granular structure; friable, nonsticky and nonplastic; many fine to coarse roots; 30 percent rock fragments; extremely acid; abrupt smooth boundary.

E—2 to 6 inches; brown (10YR 5/3) channery loam; weak fine granular structure; friable, nonsticky and nonplastic; common fine and medium roots; 25 percent rock fragments; extremely acid; abrupt wavy boundary.

Bhs—6 to 8 inches; dark reddish brown (5YR 3/3) channery sandy loam; weak medium granular structure; friable, nonsticky and nonplastic; few fine and medium roots; 25 percent rock fragments; extremely acid; abrupt smooth boundary.

Bw1—8 to 14 inches; yellowish brown (10YR 5/6) very channery sandy loam; weak medium subangular blocky structure; very friable, nonsticky and nonplastic; few fine and medium roots; 35 percent rock fragments; very strongly acid; clear wavy boundary.

Bw2—14 to 25 inches; yellowish brown (10YR 5/6) very channery sandy loam; weak medium subangular blocky structure; very friable, nonsticky and nonplastic; few fine and medium roots; 45 percent rock fragments; very strongly acid; gradual wavy boundary.

Bw3—25 to 36 inches; yellowish brown (10YR 5/6) very channery sandy loam; weak fine and medium subangular blocky structure; very friable, nonsticky and nonplastic; few fine roots; 55 percent rock fragments; very strongly acid; clear wavy boundary.

C—36 to 54 inches; yellowish brown (10YR 5/4) extremely channery loamy sand; single grain; loose, nonsticky and nonplastic; 75 percent rock fragments; very strongly acid; clear smooth boundary.

R—54 inches; grayish brown sandstone.

The solum ranges from 25 to 40 inches in thickness. The depth to bedrock ranges from 40 to 60 inches. Rock fragments make up 20 to 70 percent of the solum and 50 to 80 percent of the C horizon. In unlimed areas reaction ranges from strongly acid to extremely acid.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The E horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The fine-earth texture is loam or sandy loam.

The B horizon has hue of 5YR, 7.5YR, or 10YR, value of 3 to 6, and chroma of 3 to 8. The fine-earth texture is loam or sandy loam.

The C horizon has hue of 5YR, 7.5YR, or 10YR, value of 5 or 6, and chroma of 4 to 6. The fine-earth texture ranges from loam to loamy sand.

Leck Kill Series

The soils of the Leck Kill series are fine-loamy, mixed, mesic Typic Hapludults. These soils are deep and well drained. They are on uplands. They formed in residuum of siltstone and shale. Slope ranges from 3 to 60 percent.

Leck Kill soils are adjacent to the very deep, moderately well drained and somewhat poorly drained Albrights soils.

Typical pedon of Leck Kill channery silt loam, 25 to 60 percent slopes, in Lumber Township, Cameron County, about 1.2 miles south of Cameron; about 3,000 feet east on Stillhouse Run Road from the intersection of Pennsylvania Route 120 and Stillhouse Run, about 500 feet north of the road, in an area of woodland:

Oi—2 inches to 1 inch; recent forest litter.
Oe—1 inch to 0; black (10YR 2/1), decomposed forest litter.
A—0 to 2 inches; dark brown (7.5YR 3/2) channery silt loam; weak fine and medium granular structure; friable, nonsticky and nonplastic; many fine to coarse roots; 15 percent rock fragments; very strongly acid; abrupt smooth boundary.
E—2 to 5 inches; weak red (2.5YR 4/2) channery silt loam; weak fine and medium granular structure; friable, nonsticky and nonplastic; common fine and medium roots; 20 percent rock fragments; very strongly acid; clear wavy boundary.
Bt1—5 to 15 inches; reddish brown (2.5YR 4/4) channery silt loam; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; common faint clay films on faces of peds; few medium roots; 20 percent rock fragments; strongly acid; gradual wavy boundary.
Bt2—15 to 28 inches; reddish brown (2.5YR 4/4) channery silt loam; moderate medium subangular blocky structure; common faint clay films on faces of peds; few medium roots; 30 percent rock fragments; strongly acid; gradual wavy boundary.
C—28 to 46 inches; weak red (10R 4/3) extremely channery silt loam; single grain; friable, slightly sticky and slightly plastic; few fine roots; 70 percent rock fragments; strongly acid; clear smooth boundary.
R—46 inches; weak red (10R 4/4) shale.

The solum ranges from 24 to 40 inches in thickness. The depth to bedrock ranges from 40 to 60 inches. Rock fragments make up 15 to 35 percent of the solum and 50 to 80 percent of the C horizon. They make up less than 35 percent of the volume in the upper 20 inches of the Bt horizon. In unlimed areas reaction is strongly acid or very strongly acid.

The A horizon has hue of 7.5YR, value of 3 or 4, and chroma of 2 or 3.

The E horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 2 or 3. The fine-earth texture is silt loam.

The B horizon has hue of 5YR to 10R, value of 3 to 5, and chroma of 4 to 6. The fine-earth texture is silt loam, loam, or silty clay loam.

The C horizon has hue of 5YR to 10R, value of 3 to 5, and chroma of 4 to 6. The fine-earth texture is silt loam, loam, or silty clay loam.

Nolo Series

The soils of the Nolo series are fine-loamy, mixed, mesic Typic Fragiaquults. These soils are deep and poorly drained. They are along drainageways and in swales and depressions. They formed in residuum of sandstone. Slope ranges from 0 to 8 percent.

Nolo soils are adjacent to the deep, well drained Hazleton soils and the deep, moderately well drained Cookport soils.

Typical pedon of Nolo loam, 0 to 3 percent slopes, in Ridgway Township, Elk County, southeast of Johnsonburg; 1.2 miles southeast of the intersection of U.S. Route 219 and Pennsylvania Route 255; about 0.4 mile south of the intersection on U.S. 219 and then 1 mile east, to State Gamelands Number 28, in an area of woodland:

Oi—3 to 2 inches; leaf litter.
Oe—2 inches to 0; black (2.5YR 2/0), decomposed organic matter.
A—0 to 4 inches; very dark gray (10YR 3/1) loam; weak fine granular structure; friable, nonsticky and nonplastic; many fine to coarse roots; 10 percent rock fragments; very strongly acid; abrupt smooth boundary.
E—4 to 9 inches; light brownish gray (10YR 6/2) loam; weak fine and medium granular structure; friable, nonsticky and nonplastic; common fine and medium roots; 5 percent rock fragments; very strongly acid; clear wavy boundary.
Btg—9 to 20 inches; light brownish gray (2.5Y 6/2) sandy clay loam; many medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic;

common faint clay films on faces of peds; few fine and medium roots; 5 percent rock fragments; very strongly acid; clear wavy boundary.

Btgx1—20 to 32 inches; grayish brown (10YR 5/2) sandy clay loam; common fine and medium yellowish brown (10YR 5/4) and yellowish red (5YR 5/6) mottles; moderate coarse prismatic structure; firm and brittle, sticky and plastic; many prominent gray (2.5Y 5/0) clay and silt films on faces of prisms; 10 percent rock fragments; very strongly acid; clear wavy boundary.

Btgx2—32 to 45 inches; grayish brown (10YR 5/2) channery sandy clay loam; common fine and medium distinct gray (2.5Y 5/0), yellowish brown (10YR 5/6), and yellowish red (5YR 5/6) mottles; moderate very coarse prismatic structure; firm and brittle, sticky and slightly plastic; many prominent grayish brown (2.5Y 5/2) clay and silt films on faces of prisms; few prominent black coatings on faces of prisms; 15 percent rock fragments; very strongly acid; clear wavy boundary.

R—45 inches; grayish brown sandstone.

The solum ranges from 40 to 50 inches in thickness. Depth to the fragipan ranges from 16 to 30 inches. The depth to bedrock ranges from 40 to 60 inches. Rock fragments make up 5 to 15 percent of the A horizon and the upper part of the B horizon and 10 to 35 percent of the lower part of the B horizon and the C horizon. In unlimed areas reaction ranges from very strongly acid to extremely acid.

The A horizon has hue of 10YR to 2.5Y, value of 2 to 4, and chroma of 3 or less.

The E horizon has hue of 10YR to 2.5Y, value of 5 or 6, and chroma of 1 or 2. The fine-earth texture is loam or sandy loam.

The Btg horizon has hue of 10YR to 2.5Y, value of 3 to 6, and chroma of 1 or 2. The fine-earth texture is loam, silt loam, clay loam, or sandy clay loam. The content of sand is more than 20 percent.

The Btx horizon has hue of 10YR to 2.5Y or is neutral in hue. The faces of prisms have value of 4 to 6 and chroma of 1 or 2. Red interiors have value of 4 to 6 and chroma of 1 to 6. The fine-earth texture is loam, sandy clay loam, or clay loam.

The C horizon is neutral in hue or has hue of 10YR to 2.5Y. It has value of 4 to 6 and chroma 0 to 6. The fine-earth texture is loam, sandy clay loam, or clay loam.

Philo Series

The soils of the Philo series are coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts. These soils are very deep and moderately well drained. They are on flood plains. They formed in alluvium derived from sandstone and siltstone. Slope is 0 to 3 percent.

Philo soils are adjacent to the very deep, well drained Pope soils and the very deep, poorly drained Atkins soils.

Typical pedon of Philo silt loam, in Horton Township, Elk County; 1,500 feet north of Brandy Camp and 600 feet northeast of the intersection of U.S. Route 219 and County Route 24025, in an area of pasture:

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine and medium roots; strongly acid; abrupt smooth boundary.

Bw1—7 to 14 inches; yellowish brown (10YR 5/4) loam; weak fine and medium subangular blocky structure; friable; common fine roots; strongly acid; clear wavy boundary.

Bw2—14 to 30 inches; yellowish brown (10YR 5/4) loam; common fine distinct dark brown (7.5YR 4/4) and gray (10YR 5/1) mottles; weak medium subangular blocky structure; friable; few fine roots; 10 percent rock fragments; strongly acid; clear wavy boundary.

Cg—30 to 40 inches; gray (10YR 5/1) channery sandy loam; common medium distinct dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; single grain; very friable; few fine roots; 20 percent rock fragments; very strongly acid; clear wavy boundary.

2C—40 to 72 inches; stratified sand and gravel; few thin lenses of silt.

The solum ranges from 20 to 40 inches in thickness. The depth to mottles that have chroma of 2 or less is 12 to 24 inches. The depth to bedrock is more than 60 inches. Rock fragments make up 0 to 20 percent of the solum and 20 to 40 percent of the C horizon. In unlimed areas reaction is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The fine-earth texture is silt loam, loam, fine sandy loam, or sandy loam.

The C horizon has hue of 10YR or is neutral in hue. It has value of 4 or 5 and chroma of 0 to 2. The fine-earth texture ranges from silt loam to sand.

Pope Series

The soils of the Pope series are coarse-loamy, mixed, mesic Fluventic Dystrochrepts. These soils are very deep and well drained. They are on flood plains. They formed in alluvium derived from sandstone and

siltstone. Slope is 0 to 3 percent.

Pope soils are adjacent to the very deep, poorly drained Atkins soils and the very deep, moderately well drained Philo soils.

Typical pedon of Pope silt loam, in Shippen Township, Cameron County; 3,700 feet west of Lawn View and the intersection of Cooks Run and County Route 12003, about 500 feet south of County Route 12003, in a cultivated field:

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine and coarse roots; strongly acid; abrupt smooth boundary.

Bw1—9 to 19 inches; yellowish brown (10YR 5/6) fine sandy loam; weak fine subangular blocky structure; friable; few fine roots; strongly acid; clear wavy boundary.

Bw2—19 to 40 inches; yellowish brown (10YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable; few fine roots; strongly acid; clear wavy boundary.

C1—40 to 50 inches; yellowish brown (10YR 5/4) gravelly sandy loam; common medium distinct light brownish gray (10YR 6/2) mottles; single grain; friable; few fine roots; 20 percent coarse fragments; strongly acid; clear wavy boundary.

C2—50 to 66 inches; brown (10YR 5/3) very gravelly sandy loam; many coarse distinct strong brown (7.5YR 5/8) mottles; single grain; friable; 40 percent coarse fragments; strongly acid.

The solum ranges from 30 to 50 inches in thickness. The depth to bedrock is more than 60 inches. Rock fragments make up 0 to 30 percent of the volume to a depth of about 40 inches and 15 to 60 percent of the volume below that depth. In unlimed areas reaction is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The B horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. The fine-earth texture is silt loam, loam, fine sandy loam, or sandy loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 or 4. The fine-earth texture is loam, fine sandy loam, or sandy loam.

Udifluvents

Udifluvents consist of very deep, well drained soils on flood plains. These soils formed in mixed alluvium derived from sandstone and siltstone.

Udifluvents are adjacent to the very deep, moderately well drained Buchanan and Philo soils.

The properties of Udifluvents differ greatly from area to area. Thus, a typical pedon is not given. In a reference pedon, the surface layer is dark brown very gravelly sandy loam about 5 to 7 inches thick. The substratum to a depth of 60 inches or more is generally yellowish brown sandy loam.

The solum ranges from 3 to 10 inches in thickness. The depth to bedrock is more than 60 inches. The content of rock fragments generally ranges from 25 to 85 percent throughout the profile. In unlimed areas reaction is strongly acid to extremely acid.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 4. The fine-earth texture ranges from silt loam to sandy loam.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8. The fine-earth texture ranges from silt loam to loamy sand.

Udorthents

Udorthents consist of very deep, well drained and moderately well drained soils on uplands. These soils are mainly in the southwestern part of Elk County. They formed in areas where stripping and excavation of overburden have exposed beds of coal and clay. Slope ranges from 0 to 60 percent.

Udorthents are adjacent to the deep, well drained Hartleton soils and the deep, moderately well drained Wharton soils.

The properties of Udorthents differ greatly from area to area. Thus, a typical pedon is not given.

The solum is 0 to 10 inches thick. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 15 to 95 percent throughout the profile. In unlimed areas reaction ranges from strongly acid to extremely acid.

The A horizon has hue of 7.5YR or 10YR and value and chroma of 2 to 6. The fine-earth texture ranges from sandy loam to silty clay loam.

The C horizon has hue of 7.5YR or 10YR and value and chroma of 2 to 8. The fine-earth texture ranges from sandy loam to silty clay loam.

Wharton Series

The soils of the Wharton series are fine-loamy, mixed, mesic Aquic Hapludults. These soils are deep and moderately well drained. They are on uplands. They formed in residuum of shale and siltstone. Slope ranges from 0 to 25 percent.

Wharton soils are adjacent to the deep, well drained Hartleton soils, the deep, somewhat poorly drained Cavode soils, and the very deep, moderately well drained Buchanan soils.

Typical pedon of Wharton silt loam, 3 to 8 percent slopes, in Fox Township, Elk County; 1.4 miles east of Kersey and the intersection of Pennsylvania Route 948 and County Route 24042, along Pennsylvania Route 948, about 1,800 feet from the north side of the road, in a cultivated field:

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam; moderate fine granular structure; friable, slightly sticky and slightly plastic; common fine roots; very strongly acid; clear smooth boundary.

Bt1—7 to 12 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine subangular blocky structure; firm, slightly sticky and nonplastic; few fine roots; common distinct clay films on faces of peds; 10 percent rock fragments; very strongly acid; clear wavy boundary.

Bt2—12 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; strong medium subangular blocky structure; firm, slightly sticky and slightly plastic; few fine roots; many distinct clay films on faces of peds; 10 percent rock fragments; very strongly acid; gradual wavy boundary.

Bt3—20 to 31 inches; yellowish brown (10YR 5/6) channery silty clay loam; few medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; strong medium subangular blocky structure; firm, sticky; few very fine roots; many prominent clay films on faces of peds; 20 percent rock fragments; very strongly acid; gradual wavy boundary.

Bt4—31 to 44 inches; yellowish brown (10YR 5/6) channery silty clay loam; many coarse distinct gray (10YR 6/1) mottles; moderate coarse prismatic structure parting to weak medium platy; firm, sticky and plastic; few very fine roots; common distinct clay films on faces of peds; 20 percent rock fragments; very strongly acid; clear wavy boundary.

C—44 to 56 inches; light yellowish brown (10YR 6/4) very channery silty clay loam; common medium faint gray (10YR 6/1) and common coarse distinct strong brown (7.5YR 5/6) mottles; massive; firm, slightly sticky and slightly plastic; 55 percent rock fragments; very strongly acid; clear wavy boundary.

R—56 inches; red siltstone and shale.

The solum ranges from 30 to 54 inches in thickness. The depth to bedrock ranges from 40 to 60 inches. Rock fragments make up 0 to 20 percent of the solum and 35 to 80 percent of the C horizon. In unlimed areas reaction is strongly acid or very strongly acid.

Some pedons have an A horizon. This horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. The Ap horizon has value of 3 to 5 and chroma of 2 to 4.

The B horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. The fine-earth texture is silt loam, silty clay loam, or clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. The fine-earth texture is silt loam, silty clay loam, or clay loam.

References

(1) Allan, P.F., L.E. Garland, and R. Dugan. 1963. Rating northeastern soils for their suitability for wildlife habitat. 28th North Am. Wildl. Nat. Resour. Conf., Wildl. Manage. Inst., pp. 247-261, illus.

(2) American Association of State Highway and Transportation Officials. 1982. Standard specifications for highway materials and methods of sampling and testing. Ed. 13, 2 vols., illus.

(3) American Society for Testing and Materials. 1988. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.

(4) Berg, T.M., W.E. Edmunds, A.R. Geyer, and others. 1980. Geologic map of Pennsylvania. Pennsylvania Geol. Surv., 4th ser., map 1.

(5) Cline, Marlin G. 1949. Basic principles of soil classification. Soil Sci. 67: 81-91.

(6) Cooper, F.D. 1976. The mineral industry of Pennsylvania in 1973. Pennsylvania Geol. Surv., Inf. Circ. 81, 49 pp.

(7) Harper, J.A. 1984. Oil and gas developments in Pennsylvania in 1983. Pennsylvania Geol. Surv., Prog. Rep. 197, 86 pp.

(8) Pennsylvania Department of Commerce. 1982. Statistical abstract. 73 pp., illus.

(9) Pennsylvania Department of Environmental Resources. 1979. The state water plan, subbasin 8, Upper West Branch Susquehanna River. Bur. of Resour. Program. Bull. SWP-9, 146 pp., illus.

(10) Pennsylvania Department of Environmental Resources. 1980. The state water plan, subbasin 17, central Allegheny River. Bur. of Resour. Program. Bull. SWP-17, 171 pp., illus.

(11) Schnur, G. Luther. 1937. Yield, stand, and volume tables for even-aged upland oak forest. U.S. Dep. Agric. Tech. Bull. 560, 88 pp., illus. (Reprinted 1961)

(12) Society of American Foresters. 1954. Forest cover types of North America. Rep. Comm. Forest Types, 67 pp.

(13) Taylor, L.E., W.H. Werkheiser, and M.L. Kriz. 1983. Ground-water resource of the West Branch Susquehanna River Basin, Pennsylvania. Pennsylvania Geol. Surv., Water Resour. Rep. 56, 143 pp., illus.

(14) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.

(15) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(16) United States Department of Agriculture. 1968. The timber resources of Pennsylvania. Forest Serv. Resour. Bull. E-8.

(17) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(18) United States Department of Agriculture. 1980. Forest statistics for Pennsylvania. Forest Serv.

Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Conservation tillage. A tillage and planting system in which crop residue covers at least 30 percent of the surface after planting. Where wind erosion is the main concern, the system leaves the equivalent of at least 1,000 pounds per acre of flat small-grain residue on the surface during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can

be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material

through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:
O horizon.—An organic layer of fresh and decaying plant residue.
A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.
E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.
B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.
C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.
Cr horizon.—Soft, consolidated bedrock beneath the soil.
R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The

slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength (in tables). The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1957-81 at Bradford, in McKean County, Pennsylvania)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	26.5	11.1	18.8	55	-17	7	3.03	1.71	4.20	7	18.8
February----	28.8	11.4	20.1	55	-17	6	2.87	1.73	3.88	8	19.3
March-------	38.9	21.4	30.2	70	-6	36	3.11	1.95	4.14	8	12.8
April-------	52.8	31.9	42.4	80	10	119	3.34	2.18	4.39	8	3.5
May---------	64.3	40.7	52.5	85	22	396	3.52	2.10	4.79	9	.4
June--------	72.4	49.2	60.8	86	30	624	4.47	2.51	6.19	8	.0
July--------	75.9	53.4	64.7	88	35	766	4.40	2.91	5.75	8	.0
August------	74.7	52.6	63.7	87	33	735	3.72	2.04	5.19	7	.0
September---	67.9	46.2	57.1	84	26	513	3.83	2.27	5.22	8	.0
October-----	56.2	36.4	46.3	77	16	228	3.24	1.78	4.53	8	1.1
November----	43.1	28.3	35.7	67	5	56	3.50	2.26	4.62	10	8.3
December----	31.1	17.5	24.3	58	-11	13	3.48	2.25	4.58	9	20.2
Yearly:											
Average---	52.7	33.3	43.1	---	---	---	---	---	---	---	---
Extreme---	---	---	---	90	-19	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,499	42.51	37.21	47.94	98	84.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1957-81 at Bradford, in McKean County, Pennsylvania)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 18	June 1	June 15
2 years in 10 later than--	May 12	May 27	June 10
5 years in 10 later than--	May 1	May 18	May 31
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 28	Sept. 17	Aug. 27
2 years in 10 earlier than--	Oct. 5	Sept. 23	Sept. 4
5 years in 10 earlier than--	Oct. 16	Oct. 5	Sept. 19

TABLE 3.--GROWING SEASON

(Recorded in the period 1957-81 at Bradford, in McKean County, Pennsylvania)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	141	114	80
8 years in 10	150	123	90
5 years in 10	167	140	109
2 years in 10	185	156	129
1 year in 10	194	165	139

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Elk County	Cameron County	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
AbB	Albrights silt loam, 3 to 8 percent slopes	313	1,040	1,353	0.2
AbC	Albrights silt loam, 8 to 15 percent slopes	191	2,905	3,096	0.4
AbD	Albrights silt loam, 15 to 25 percent slopes	168	1,324	1,492	0.2
At	Atkins silt loam	497	1,453	1,950	0.3
Ba	Barbour fine sandy loam	0	397	397	0.1
Bb	Basher silt loam	617	1,548	2,165	0.3
BrA	Brinkerton silt loam, 0 to 3 percent slopes	6,044	137	6,181	0.8
BrB	Brinkerton silt loam, 3 to 8 percent slopes	16,146	776	16,922	2.1
BsB	Brinkerton silt loam, 0 to 8 percent slopes, very stony	5,710	200	5,910	0.7
BuB	Buchanan silt loam, 3 to 8 percent slopes	13,269	1,075	14,344	1.8
BuC	Buchanan silt loam, 8 to 15 percent slopes	20,709	3,411	24,120	3.1
BuD	Buchanan silt loam, 15 to 25 percent slopes	8,795	2,855	11,650	1.5
BxB	Buchanan silt loam, 0 to 8 percent slopes, very stony	6,266	1,098	7,364	0.9
BxD	Buchanan silt loam, 8 to 25 percent slopes, very stony	25,000	4,601	29,601	3.7
CaA	Cavode silt loam, 0 to 3 percent slopes	1,851	319	2,170	0.3
CaB	Cavode silt loam, 3 to 8 percent slopes	12,090	1,010	13,100	1.6
CaC	Cavode silt loam, 8 to 15 percent slopes	2,962	385	3,347	0.4
CdB	Cavode silt loam, 0 to 8 percent slopes, very stony	2,842	119	2,961	0.4
CdD	Cavode silt loam, 8 to 25 percent slopes, very stony	1,232	0	1,232	0.2
CoA	Cookport channery loam, 0 to 3 percent slopes	5,998	1,653	7,651	1.0
CoB	Cookport channery loam, 3 to 8 percent slopes	23,653	4,367	28,020	3.6
CoC	Cookport channery loam, 8 to 15 percent slopes	7,262	1,352	8,614	1.1
CpB	Cookport channery loam, 0 to 8 percent slopes, very stony	25,828	10,455	36,283	4.6
CpD	Cookport channery loam, 8 to 25 percent slopes, very stony	23,570	6,788	30,358	3.8
HaB	Hartleton channery silt loam, 3 to 8 percent slopes	14,500	3,445	17,945	2.3
HaC	Hartleton channery silt loam, 8 to 15 percent slopes	12,566	4,765	17,331	2.2
HaD	Hartleton channery silt loam, 15 to 25 percent slopes	11,976	3,593	15,569	2.0
HaF	Hartleton channery silt loam, 25 to 60 percent slopes	69,110	51,034	120,144	15.2
HeB	Hartleton channery silt loam, 0 to 8 percent slopes, very stony	1,344	73	1,417	0.2
HeD	Hartleton channery silt loam, 8 to 25 percent slopes, very stony	2,366	278	2,644	0.3
HoB	Hazleton channery loam, 3 to 8 percent slopes	25,716	8,635	34,351	4.4
HoC	Hazleton channery loam, 8 to 15 percent slopes	10,575	4,862	15,437	1.9
HoD	Hazleton channery loam, 15 to 25 percent slopes	5,279	5,239	10,518	1.3
HxB	Hazleton channery loam, 0 to 8 percent slopes, very stony	16,225	14,343	30,568	3.9
HxD	Hazleton channery loam, 8 to 25 percent slopes, very stony	23,538	15,927	39,465	5.0
HxF	Hazleton channery loam, 25 to 60 percent slopes, very stony	37,655	32,242	69,897	8.9
HyE	Hazleton channery loam, 8 to 35 percent slopes, extremely bouldery	1,084	563	1,647	0.2
LeB	Leck Kill channery silt loam, 3 to 8 percent slopes	1,157	1,025	2,182	0.3
LeC	Leck Kill channery silt loam, 8 to 15 percent slopes	494	2,315	2,809	0.4
LeD	Leck Kill channery silt loam, 15 to 25 percent slopes	31	6,221	6,252	0.8
LeF	Leck Kill channery silt loam, 25 to 60 percent slopes	5,225	35,845	41,070	5.2
NoA	Nolo loam, 0 to 3 percent slopes	3,081	26	3,107	0.4
NoB	Nolo loam, 3 to 8 percent slopes	1,455	88	1,543	0.2
NxB	Nolo loam, 0 to 8 percent slopes, very stony	3,053	1,071	4,124	0.5
Ph	Philo silt loam	5,411	2,754	8,165	1.0
Po	Pope silt loam	837	545	1,382	0.2
Ub	Udifluvents-Buchanan complex	3,239	1,991	5,230	0.7
Ud	Udorthents, sandstone and shale	6,606	1,099	7,705	1.0
Us	Udorthents, sandstone and shale, smoothed	4,212	24	4,236	0.5
WaB	Wharton silt loam, 3 to 8 percent slopes	26,524	3,032	29,556	3.7
WaC	Wharton silt loam, 8 to 15 percent slopes	15,512	2,372	17,884	2.3
WaD	Wharton silt loam, 15 to 25 percent slopes	3,720	367	4,087	0.5
WxB	Wharton silt loam, 0 to 8 percent slopes, very stony	2,699	283	2,982	0.4
WxD	Wharton silt loam, 8 to 25 percent slopes, very stony	3,044	262	3,306	0.4
	Water	3,353	1,513	4,866	0.6
	Total	532,600	255,100	787,700	100.0

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland)

Map symbol	Soil name
AbB	Albrights silt loam, 3 to 8 percent slopes
Ba	Barbour fine sandy loam
Bb	Basher silt loam
BuB	Buchanan silt loam, 3 to 8 percent slopes
CoA	Cookport channery loam, 0 to 3 percent slopes
CoB	Cookport channery loam, 3 to 8 percent slopes
HoB	Hazleton channery loam, 3 to 8 percent slopes
LeB	Leck Kill channery silt loam, 3 to 8 percent slopes
Ph	Philo silt loam
Po	Pope silt loam
WaB	Wharton silt loam, 3 to 8 percent slopes

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
		Bu	Tons	Bu	Bu	Tons	Tons	AUM*
AbB---------- Albrights	IIe	100	20	70	40	3.5	3.0	6.5
AbC---------- Albrights	IIIe	90	18	65	40	3.5	3.0	6.5
AbD---------- Albrights	IVe	80	16	55	35	3.5	3.0	6.5
At---------- Atkins	IIIw	100	20	60	30	---	3.0	5.5
Ba---------- Barbour	I	120	24	80	50	4.5	3.5	8.5
Bb---------- Basher	IIw	120	---	80	50	4.5	3.5	8.5
BrA---------- Brinkerton	IVw	90	18	60	30	---	2.5	5.0
BrB---------- Brinkerton	IVw	90	18	60	30	---	2.5	5.0
BsB---------- Brinkerton	VIs	---	---	---	---	---	---	---
BuB---------- Buchanan	IIe	100	20	65	40	3.5	3.0	6.5
BuC---------- Buchanan	IIIe	90	18	60	35	3.5	3.0	6.5
BuD---------- Buchanan	IVe	85	16	60	35	3.0	2.5	6.5
BxB, BxD--------- Buchanan	VIs	---	---	---	---	---	---	---
CaA---------- Cavode	IIIw	85	17	65	35	---	3.0	5.5
CaB---------- Cavode	IIIw	85	17	65	35	---	3.0	5.5
CaC---------- Cavode	IIIe	80	16	60	30	---	3.0	5.5
CdB, CdD--------- Cavode	VIs	---	---	---	---	---	---	---
CoA---------- Cookport	IIw	100	20	65	40	3.5	3.0	6.5
CoB---------- Cookport	IIe	100	20	65	40	3.5	3.0	6.5

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
		Bu	Tons	Bu	Bu	Tons	Tons	AUM*
CoC---------- Cookport	IIIe	90	18	60	35	3.5	3.0	6.5
CpB, CpD-------- Cookport	VIs	---	---	---	---	---	---	---
HaB---------- Hartleton	IIe	80	17	65	40	3.0	2.5	6.0
HaC---------- Hartleton	IIIe	75	15	60	35	3.0	2.5	6.0
HaD---------- Hartleton	IVe	70	14	55	30	3.0	2.0	6.0
HaF---------- Hartleton	VIIe	---	---	---	---	---	---	---
HeB, HeD-------- Hartleton	VIs	---	---	---	---	---	---	---
HoB---------- Hazleton	IIe	125	25	75	45	4.5	3.5	8.0
HoC---------- Hazleton	IIIe	115	23	70	40	4.5	3.5	8.0
HoD---------- Hazleton	IVe	110	22	60	35	4.0	3.0	7.5
HxB, HxD-------- Hazleton	VIs	---	---	---	---	---	---	---
HxF, HyE-------- Hazleton	VIIs	---	---	---	---	---	---	---
LeB---------- Leck Kill	IIe	125	25	---	50	4.5	3.0	5.0
LeC---------- Leck Kill	IIIe	120	24	---	50	4.0	3.0	4.5
LeD---------- Leck Kill	IVe	105	21	65	45	4.0	2.5	4.0
LeF---------- Leck Kill	VIIe	---	---	---	---	---	---	---
NoA---------- Nolo	IVw	80	16	60	35	---	2.5	5.0
NoB---------- Nolo	IVw	80	16	60	---	---	2.5	5.0
NxB---------- Nolo	VIIs	---	---	---	---	---	---	---
Ph---------- Philo	IIw	130	---	80	45	4.5	3.5	8.5

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
		Bu	Tons	Bu	Bu	Tons	Tons	AUM*
Po---------- Pope	I	130	---	80	45	---	4.0	8.0
Ub**---------- Udifluvents. Buchanan--------	IIe	---	---	---	---	---	---	---
Ud. Udorthents								
Us. Udorthents								
WaB---------- Wharton	IIe	90	18	65	40	3.5	3.0	6.5
WaC---------- Wharton	IIIe	80	16	60	35	3.5	3.0	6.5
WaD---------- Wharton	IVe	70	14	55	30	3.0	2.5	5.5
WxB, WxD-------- Wharton	VIs	---	---	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	1,779	---	---	---
II	145,732	127,751	17,981	---
III	109,858	92,638	17,220	---
IV	66,982	39,229	27,753	---
V	---	---	---	---
VI	163,733	---	---	163,733
VII	236,882	161,214	---	75,668
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
AbB---------- Albrights	4A	Slight	Slight	Slight	Slight	Northern red oak----	70	4	Red pine, eastern white pine, Japanese larch, Norway spruce, white spruce.
						Yellow poplar-------	75	4	
						White ash----------	---	---	
						Red maple----------	---	---	
AbC---------- Albrights	4A	Slight	Slight	Slight	Slight	Northern red oak----	70	4	Red pine, eastern white pine, Japanese larch, Norway spruce, white spruce.
						Yellow poplar-------	75	4	
						White ash----------	---	---	
						Red maple----------	---	---	
AbD---------- Albrights	4R	Moderate	Moderate	Slight	Slight	Northern red oak----	70	4	Red pine, eastern white pine, Japanese larch, Norway spruce, white spruce.
						Yellow poplar-------	75	4	
						White ash----------	---	---	
						Red maple----------	---	---	
At---------- Atkins	4W	Slight	Severe	Severe	Moderate	Pin oak----------	100	4	Eastern white pine, white spruce.
						Loblolly pine-------	83	8	
						Sweetgum----------	95	8	
						Eastern cottonwood--	105	10	
						Red maple----------	---	---	
						American sycamore---	---	---	
Ba---------- Barbour	3A	Slight	Slight	Slight	Slight	Sugar maple---------	70	3	Eastern white pine, Norway spruce, black walnut.
						Northern red oak----	80	4	
Bb---------- Basher	3A	Slight	Slight	Slight	Slight	Sugar maple---------	70	3	Eastern white pine, black walnut, Norway spruce, European larch.
						Northern red oak----	80	4	
						American basswood---	85	4	
BrA, BrB, BsB------ Brinkerton	4W	Slight	Severe	Severe	Moderate	Northern red oak----	77	4	Eastern white pine, white spruce, red maple, yellow poplar.
BuB, BuC---------- Buchanan	4A	Slight	Slight	Slight	Slight	Northern red oak----	80	4	Northern red oak, yellow poplar, sugar maple, eastern white pine, Japanese larch, Norway spruce.
						Yellow poplar-------	90	6	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
BuD---- Buchanan	4R	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow poplar-------	80 90	4 6	Northern red oak, yellow poplar, sugar maple, eastern white pine, Japanese larch, Norway spruce.
BxB---- Buchanan	4A	Slight	Slight	Slight	Slight	Northern red oak---- Yellow poplar-------	80 90	4 6	Northern red oak, yellow poplar, sugar maple, eastern white pine, European larch.
BxD---- Buchanan	4R	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow poplar-------	80 90	4 6	Northern red oak, yellow poplar, sugar maple, eastern white pine, European larch.
CaA, CaB---- Cavode	4W	Slight	Moderate	Moderate	Moderate	Northern red oak---- Yellow poplar-------	83 95	4 7	Eastern white pine, yellow poplar, black cherry, Norway spruce, white spruce.
CaC---- Cavode	4W	Moderate	Moderate	Moderate	Moderate	Northern red oak---- Yellow poplar-------	83 95	4 7	Eastern white pine, yellow poplar, black cherry, Norway spruce, white spruce.
CdB---- Cavode	4W	Slight	Moderate	Moderate	Moderate	Northern red oak---- Yellow poplar-------	83 95	4 7	Eastern white pine, yellow poplar, black cherry, Norway spruce, white spruce.
CdD---- Cavode	4W	Moderate	Moderate	Moderate	Moderate	Northern red oak---- Yellow poplar-------	83 95	4 7	Eastern white pine, yellow poplar, black cherry, Norway spruce, white spruce.
CoA, CoB, CoC---- Cookport	4W	Slight	Moderate	Slight	Slight	Northern red oak---- Black cherry-------- Yellow poplar------- White ash---------- Sugar maple---------	76 86 90 86 80	4 4 6 4 4	Yellow poplar, eastern white pine, black cherry, Japanese larch, Norway spruce.
CpB---- Cookport	4W	Slight	Moderate	Slight	Slight	Northern red oak---- Black cherry-------- Yellow poplar------- White ash---------- Sugar maple---------	76 86 90 86 80	4 4 6 4 4	Yellow poplar, eastern white pine, Japanese larch, Norway spruce.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
CpD---------- Cookport	4W	Moderate	Moderate	Slight	Slight	Northern red oak----	76	4	Yellow poplar, eastern white pine, Japanese larch, Norway spruce.
						Black cherry--------	86	4	
						Yellow poplar-------	90	6	
						White ash-----------	86	4	
						Sugar maple---------	80	4	
HaB---------- Hartleton	4F	Slight	Moderate	Slight	Slight	Northern red oak----	70	4	Virginia pine, eastern white pine, European larch, Norway spruce, red pine.
						Chestnut oak--------	70	4	
						Eastern white pine--	70	9	
						Virginia pine-------	70	8	
HaC---------- Hartleton	4F	Slight	Slight	Slight	Slight	Northern red oak----	70	4	Virginia pine, eastern white pine, European larch, Norway spruce, red pine.
						Chestnut oak--------	70	4	
						Eastern white pine--	70	9	
						Virginia pine-------	70	8	
HaD---------- Hartleton	4R	Slight	Moderate	Slight	Slight	Northern red oak----	70	4	Virginia pine, eastern white pine, European larch, Norway spruce, red pine.
						Chestnut oak--------	70	4	
						Eastern white pine--	70	9	
						Virginia pine-------	70	8	
HaF---------- Hartleton	4R	Moderate	Severe	Slight	Slight	Northern red oak----	70	4	Virginia pine, eastern white pine, European larch, Norway spruce, red pine.
						Chestnut oak--------	70	4	
						Eastern white pine--	70	9	
						Virginia pine-------	70	8	
HeB---------- Hartleton	4F	Slight	Slight	Slight	Slight	Northern red oak----	70	4	Virginia pine, eastern white pine.
						Chestnut oak--------	70	4	
HeD---------- Hartleton	4R	Moderate	Moderate	Slight	Slight	Eastern white pine--	70	9	European larch, Norway spruce.
						Virginia pine-------	70	8	
HoB, HoC, HoD, HxB, HxD---------- Hazleton	4F	Slight	Slight	Slight	Slight	Northern red oak----	70	4	Japanese larch, eastern white pine, Norway spruce, Austrian pine, black cherry.
						Yellow poplar-------	80	5	
HxF---------- Hazleton	4R	Moderate	Severe	Slight	Slight	Northern red oak----	70	4	Japanese larch, eastern white pine, Norway spruce, Austrian pine, black cherry.
						Yellow poplar-------	80	5	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
HyE---------- Hazleton	4R	Slight	Moderate	Slight	Slight	Northern red oak----	70	4	Japanese larch, eastern white pine, Norway spruce, Austrian pine, black cherry.
						Yellow poplar-------	80	5	
LeB, LeC---------- Leck Kill	4A	Slight	Slight	Slight	Slight	Northern red oak----	68	4	Eastern white pine, Virginia pine.
LeD---------- Leck Kill	4R	Slight	Moderate	Slight	Slight	Northern red oak----	68	4	Eastern white pine, Virginia pine.
LeF---------- Leck Kill	4R	Moderate	Severe	Slight	Slight	Northern red oak----	68	4	Eastern white pine, Virginia pine.
NoA, NoB, NxB------ Nolo	4W	Slight	Severe	Severe	Moderate	Northern red oak----	70	4	Eastern white pine, Norway spruce, red maple.
						Black cherry--------	70	3	
						Red maple-----------	---	---	
Ph---------- Philo	4W	Slight	Moderate	Slight	Slight	Northern red oak----	86	4	Eastern white pine, yellow poplar.
						Yellow poplar-------	102	8	
						Virginia pine-------	74	8	
						Black oak-----------	85	4	
						White oak-----------	85	4	
						White ash-----------	85	4	
Po---------- Pope	7A	Slight	Slight	Slight	Slight	Yellow poplar-------	96	7	Eastern white pine, yellow poplar, white oak, northern red oak, white ash, eastern hemlock.
						American beech------	---	---	
						White oak-----------	80	4	
						Blackgum------------	---	---	
						American sycamore---	---	---	
						Northern red oak----	---	---	
						American basswood---	---	---	
						Eastern hemlock-----	---	---	
						Bitternut hickory---	---	---	
Ub**: Udifluvents.									
Buchanan----------	4A	Slight	Slight	Slight	Slight	Northern red oak----	80	4	Northern red oak, yellow poplar, sugar maple, eastern white pine, Japanese larch, Norway spruce.
						Yellow poplar-------	90	6	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
WaB---------- Wharton	4A	Slight	Slight	Slight	Slight	Northern red oak----	76	4	Eastern white pine,
						Yellow poplar-------	90	6	Japanese larch,
									Norway spruce,
									yellow poplar.
WaC, WaD---------- Wharton	4R	Moderate	Slight	Slight	Slight	Northern red oak----	76	4	Eastern white pine,
						Yellow poplar-------	90	6	Japanese larch,
									Norway spruce,
									yellow poplar.
WxB---------- Wharton	4A	Slight	Slight	Slight	Slight	Northern red oak----	76	4	Eastern white pine,
						Yellow poplar-------	90	6	yellow poplar.
WxD---------- Wharton	4R	Moderate	Moderate	Moderate	Slight	Northern red oak----	76	4	Eastern white pine,
						Yellow poplar-------	90	6	yellow poplar.

* Productivity class is the yield in cubic meters per hectare per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe")

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AbB Albrights	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: wetness.
AbC Albrights	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Moderate: wetness.	Severe: wetness.
AbD Albrights	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness.	Moderate: wetness.	Severe: wetness, slope.
At Atkins	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Ba Barbour	Severe: flooding.	Slight	Moderate: small stones.	Slight	Moderate: droughty.
Bb Basher	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, flooding.
BrA, BrB Brinkerton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
BsB Brinkerton	Severe: wetness.	Severe: wetness.	Severe: wetness, large stones.	Severe: wetness.	Severe: wetness.
BuB Buchanan	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones.	Slight	Moderate: large stones.
BuC Buchanan	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Slight	Moderate: large stones, slope.
BuD Buchanan	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
BxB Buchanan	Moderate: wetness, large stones.	Moderate: wetness, large stones.	Severe: large stones, small stones.	Slight	Severe: small stones.
BxD Buchanan	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: slope.	Severe: slope, small stones.
CaA, CaB Cavode	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
CaC Cavode	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CdB Cavode	Severe: wetness.	Severe: wetness.	Severe: wetness, large stones.	Severe: wetness.	Severe: wetness.
CdD Cavode	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness, large stones.	Severe: wetness.	Severe: slope, wetness.
CoA, CoB Cookport	Moderate: small stones, wetness.	Moderate: small stones, wetness.	Severe: small stones.	Slight	Moderate: small stones, wetness.
CoC Cookport	Moderate: slope, small stones, wetness.	Moderate: slope, small stones, wetness.	Severe: slope.	Slight	Moderate: slope, small stones, wetness.
CpB Cookport	Moderate: wetness, large stones.	Moderate: large stones, wetness.	Severe: large stones.	Slight	Moderate: large stones, wetness.
CpD Cookport	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: slope.	Severe: slope.
HaB Hartleton	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: large stones, slope.
HaC Hartleton	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Severe: large stones.
HaD Hartleton	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: large stones, slope.
HaF Hartleton	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: large stones, slope.
HeB Hartleton	Moderate: large stones, small stones.	Moderate: large stones, small stones.	Severe: large stones, small stones.	Moderate: large stones.	Severe: large stones.
HeD Hartleton	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.	Severe: large stones, slope.
HoB Hazleton	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones, droughty.
HoC Hazleton	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Slight	Moderate: slope, small stones.
HoD Hazleton	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope.	Severe: slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HxB Hazleton	Moderate: large stones.	Moderate: large stones.	Severe: small stones, large stones.	Slight	Moderate: large stones.
HxD Hazleton	Severe: slope.	Severe: slope.	Severe: slope, small stones, large stones.	Moderate: slope.	Severe: slope.
HxF Hazleton	Severe: slope.	Severe: slope.	Severe: slope, small stones, large stones.	Severe: slope.	Severe: slope.
HyE Hazleton	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, small stones, large stones.	Moderate: slope, large stones.	Severe: slope, large stones.
LeB Leck Kill	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
LeC Leck Kill	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
LeD Leck Kill	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
LeF Leck Kill	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
NoA, NoB Nolo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
NxB Nolo	Severe: wetness.	Severe: wetness.	Severe: large stones.	Severe: wetness.	Severe: wetness.
Ph Philo	Severe: flooding.	Moderate: wetness.	Moderate: flooding, wetness.	Slight	Moderate: flooding.
Po Pope	Severe: flooding.	Slight	Moderate: small stones.	Slight	Slight.
Ub*: Udifluvents	Severe: flooding, wetness.	Moderate: wetness.	Severe: flooding, wetness.	Moderate: wetness.	Moderate: wetness.
Buchanan	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: large stones, small stones.	Slight	Severe: small stones.
Ud, Us Udorthents	Variable	Variable	Variable	Variable	Variable.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
WaB Wharton	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, percs slowly, wetness.	Slight	Moderate: wetness.
WaC Wharton	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, small stones.	Slight	Moderate: slope, wetness.
WaD Wharton	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
WxB Wharton	Moderate: wetness, large stones.	Moderate: wetness, large stones.	Severe: large stones.	Slight	Moderate: large stones, wetness.
WxD Wharton	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AbB---- Albrights	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AbC---- Albrights	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AbD---- Albrights	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
At---- Atkins	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
Ba---- Barbour	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Bb---- Basher	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
BrA---- Brinkerton	Poor	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
BrB---- Brinkerton	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
BsB---- Brinkerton	Very poor.	Poor	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
BuB---- Buchanan	Fair	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.
BuC---- Buchanan	Fair	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.
BuD---- Buchanan	Poor	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
BxB---- Buchanan	Very poor.	Poor	Good	Good	Fair	Fair	Very poor.	Poor	Good	Poor.
BxD---- Buchanan	Very poor.	Poor	Good	Good	Fair	Poor	Very poor.	Poor	Good	Very poor.
CaA---- Cavode	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CaB---- Cavode	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CaC---- Cavode	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CdB---- Cavode	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
CdD---- Cavode	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
CoA---- Cookport	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CoB---- Cookport	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CoC---- Cookport	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CpB---- Cookport	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
CpD---- Cookport	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
HaB---- Hartleton	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HaC---- Hartleton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HaD---- Hartleton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HaF---- Hartleton	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
HeB---- Hartleton	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Fair	Very poor.
HeD---- Hartleton	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
HoB---- Hazleton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HoC---- Hazleton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HoD---- Hazleton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
HxB---- Hazleton	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
HxD, HxF---- Hazleton	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
HyE---- Hazleton	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
LeB---- Leck Kill	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LeC---- Leck Kill	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LeD---- Leck Kill	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LeF---- Leck Kill	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
NoA---------- Nolo	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
NoB---------- Nolo	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
NxB---------- Nolo	Very poor.	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Ph---------- Philo	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Po---------- Pope	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ub*:										
Udifluvents-------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Buchanan----------	Fair	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.
Ud---------- Udorthents	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Us---------- Udorthents	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
WaB---------- Wharton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WaC---------- Wharton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WaD---------- Wharton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WxB---------- Wharton	Very poor.	Good	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
WxD---------- Wharton	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AbB---Albrights	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
AbC---Albrights	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Severe: wetness.	Severe: wetness.
AbD---Albrights	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.
At---Atkins	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, frost action.	Severe: wetness, flooding.
Ba---Barbour	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Moderate: droughty.
Bb---Basher	Severe: wetness, cutbanks cave.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: wetness, flooding.
BrA, BrB, BsB---Brinkerton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action, low strength.	Severe: wetness.
BuB---Buchanan	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: wetness, frost action.	Moderate: large stones.
BuC---Buchanan	Severe: wetness.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Moderate: slope, wetness, frost action.	Moderate: large stones, slope.
BuD---Buchanan	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: slope.	Severe: slope.
BxB---Buchanan	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Severe: small stones.
BxD---Buchanan	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
CaA, CaB---Cavode	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CaC---------- Cavode	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.
CdB---------- Cavode	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.
CdD---------- Cavode	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness, low strength.	Severe: slope, wetness.
CoA---------- Cookport	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, low strength.	Moderate: small stones, wetness.
CoB---------- Cookport	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: wetness, low strength.	Moderate: small stones, wetness.
CoC---------- Cookport	Severe: wetness.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Moderate: slope, wetness, low strength.	Moderate: slope, small stones, wetness.
CpB---------- Cookport	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: wetness, low strength.	Moderate: large stones, wetness.
CpD---------- Cookport	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Severe: slope.
HaB---------- Hartleton	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.
HaC---------- Hartleton	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: large stones.
HaD, HaF---------- Hartleton	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.
HeB---------- Hartleton	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.
HeD---------- Hartleton	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.
HoB---------- Hazleton	Moderate: depth to rock, large stones.	Moderate: large stones.	Moderate: large stones, depth to rock.	Moderate: slope, large stones.	Moderate: frost action, large stones.	Moderate: small stones, droughty.
HoC---------- Hazleton	Moderate: depth to rock, slope, large stones.	Moderate: slope, large stones.	Moderate: slope, large stones, depth to rock.	Severe: slope.	Moderate: slope, frost action, large stones.	Moderate: slope, small stones.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
HoD---------- Hazleton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HxB---------- Hazleton	Moderate: depth to rock, large stones.	Moderate: large stones.	Moderate: large stones, depth to rock.	Moderate: slope, large stones.	Moderate: frost action, large stones.	Moderate: large stones.
HxD, HxF---------- Hazleton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HyE---------- Hazleton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, large stones.
LeB---------- Leck Kill	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: small stones.
LeC---------- Leck Kill	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, slope.
LeD, LeF---------- Leck Kill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
NoA, NoB, NxB----- Nolo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Ph---------- Philo	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Po---------- Pope	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
Ub*: Udifluvents------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness.
Buchanan---------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: wetness, frost action.	Moderate: large stones.
Ud, Us---------- Udorthents	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
WaB---------- Wharton	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: slope, wetness, shrink-swell.	Severe: frost action, low strength.	Moderate: wetness.
WaC---------- Wharton	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope, wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WaD---------- Wharton	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope, frost action, low strength.	Severe: slope.
WxB---------- Wharton	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: frost action, low strength.	Moderate: large stones, wetness.
WxD---------- Wharton	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope, frost action, low strength.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "good," and other terms. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AbB Albrights	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: small stones, wetness.
AbC Albrights	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: small stones, wetness.
AbD Albrights	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope.	Severe: wetness, slope.	Poor: small stones, slope, wetness.
At Atkins	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness, seepage.	Poor: wetness.
Ba Barbour	Severe: poor filter, wetness.	Severe: flooding, seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
Bb Basher	Severe: flooding, wetness.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness.	Poor: seepage, too sandy, small stones.
BrA Brinkerton	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
BrB, BsB Brinkerton	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
BuB Buchanan	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Poor: small stones.
BuC Buchanan	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Poor: small stones.
BuD Buchanan	Severe: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
BxB Buchanan	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Poor: small stones.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BxD---------- Buchanan	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: wetness, slope.	Severe: slope.	Poor: small stones, slope.
CaA---------- Cavode	Severe: percs slowly, wetness.	Moderate: depth to rock.	Severe: wetness, depth to rock, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
CaB---------- Cavode	Severe: percs slowly, wetness.	Moderate: slope, depth to rock.	Severe: wetness, depth to rock, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
CaC---------- Cavode	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, depth to rock, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
CdB---------- Cavode	Severe: percs slowly, wetness.	Moderate: slope, depth to rock.	Severe: wetness, depth to rock, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
CdD---------- Cavode	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: depth to rock, wetness, slope.	Severe: slope, wetness.	Poor: slope, too clayey, wetness.
CoA, CoB---------- Cookport	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, depth to rock.	Moderate: wetness, depth to rock.	Fair: small stones, wetness.
CoC---------- Cookport	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, depth to rock.	Moderate: slope, wetness, depth to rock.	Fair: small stones, wetness, slope.
CpB---------- Cookport	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, depth to rock.	Moderate: wetness, depth to rock.	Fair: area reclaim, too clayey, wetness.
CpD---------- Cookport	Severe: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: slope, wetness, depth to rock.	Severe: slope.	Poor: slope.
HaB---------- Hartleton	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: large stones, slope.
HaC---------- Hartleton	Severe: large stones.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: large stones.
HaD, HaF---------- Hartleton	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: large stones, slope.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HeB---------- Hartleton	Severe: large stones.	Severe: seepage, large stones.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: large stones.
HeD---------- Hartleton	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: large stones, slope.
HoB---------- Hazleton	Severe: poor filter.	Severe: seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: small stones.
HoC---------- Hazleton	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: small stones.
HoD---------- Hazleton	Severe: poor filter, slope.	Severe: slope, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, small stones.
HxB---------- Hazleton	Severe: poor filter.	Severe: seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: small stones.
HxD, HxF---------- Hazleton	Severe: poor filter, slope.	Severe: slope, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, small stones.
HyE---------- Hazleton	Severe: slope, poor filter.	Severe: slope, seepage, large stones.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope, small stones.
LeB---------- Leck Kill	Moderate: percs slowly, depth to rock.	Severe: seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: small stones.
LeC---------- Leck Kill	Moderate: percs slowly, slope, depth to rock.	Severe: seepage, slope.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: small stones.
LeD, LeF---------- Leck Kill	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, depth to rock.	Severe: seepage, slope.	Poor: small stones, slope.
NoA, NoB, NxB------- Nolo	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, wetness.	Severe: wetness.	Poor: wetness, thin layer.
Ph---------- Philo	Severe: flooding, wetness, poor filter.	Severe: flooding, wetness, seepage.	Severe: flooding, seepage.	Severe: flooding, wetness.	Fair: area reclaim, wetness, thin layer.
Po---------- Pope	Moderate: flooding, percs slowly.	Severe: seepage, flooding.	Severe: seepage.	Severe: seepage.	Good.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ub*:					
Udifluvents	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding.	Severe: flooding, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
Buchanan	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Poor: small stones.
Ud, Us Udorthents	Variable	Variable	Variable	Variable	Variable.
WaB Wharton	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
WaC Wharton	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Fair: slope, too clayey.
WaD Wharton	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Poor: slope.
WxB Wharton	Severe: percs slowly, wetness.	Moderate: slope.	Severe: depth to rock, wetness.	Moderate: wetness.	Fair: too clayey.
WxD Wharton	Severe: percs slowly, wetness, slope.	Severe: slope.	Severe: slope, wetness, depth to rock.	Severe: slope.	Poor: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "good," "fair," and other terms. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AbB, AbC Albrights	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
AbD Albrights	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
At Atkins	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ba Barbour	Good	Probable	Probable	Poor: small stones, area reclaim.
Bb Basher	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
BrA, BrB, BsB Brinkerton	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
BuB, BuC Buchanan	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
BuD Buchanan	Fair: slope, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
BxB Buchanan	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
BxD Buchanan	Fair: slope, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, area reclaim.
CaA, CaB, CaC, CdB Cavode	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
CdD Cavode	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, wetness.
CoA, CoB, CoC Cookport	Fair: low strength, wetness, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CpB---------- Cookport	Fair: area reclaim, wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
CpD---------- Cookport	Fair: area reclaim, wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
HaB---------- Hartleton	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
HaC---------- Hartleton	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
HaD---------- Hartleton	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
HaF---------- Hartleton	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
HeB---------- Hartleton	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
HeD---------- Hartleton	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
HoB, HoC---------- Hazleton	Fair: area reclaim, thin layer, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
HoD---------- Hazleton	Fair: slope, area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
HxB---------- Hazleton	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
HxD---------- Hazleton	Fair: slope, area reclaim, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
HxF---------- Hazleton	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HyE---------- Hazleton	Fair: slope, large stones, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, large stones, small stones.
LeB, LeC---------- Leck Kill	Fair: thin layer, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
LeD---------- Leck Kill	Fair: thin layer, slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
LeF---------- Leck Kill	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
NoA, NoB, NxB--------- Nolo	Poor: wetness, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
Ph---------- Philo	Fair: area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Po---------- Pope	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Ub*:				
Udifluvents----------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
Buchanan----------	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Ud, Us---------- Udorthents	Variable----------	Variable----------	Variable----------	Variable.
WaB, WaC---------- Wharton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
WaD---------- Wharton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, area reclaim.
WxB---------- Wharton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
WxD---------- Wharton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, area reclaim.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AbB---- Albrights	Moderate: slope.	Severe: piping, wetness.	Severe: no water.	Slope----	Wetness, rooting depth, slope.	Wetness, rooting depth.	Wetness, droughty, rooting depth.
AbC, AbD---- Albrights	Severe: slope.	Severe: piping, wetness.	Severe: no water.	Slope----	Wetness, rooting depth, slope.	Slope, wetness, rooting depth.	Wetness, slope, droughty.
At---- Atkins	Severe: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action, percs slowly.	Wetness, flooding, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Ba---- Barbour	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty----	Too sandy----	Droughty.
Bb---- Basher	Moderate: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave, slow refill.	Flooding, frost action, cutbanks cave.	Flooding, wetness.	Wetness, too sandy.	Favorable.
BrA---- Brinkerton	Slight----	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Percs slowly, wetness, rooting depth.	Percs slowly, wetness, rooting depth.
BrB---- Brinkerton	Moderate: slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Percs slowly, wetness, rooting depth.	Percs slowly, wetness, rooting depth.
BsB---- Brinkerton	Moderate: slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Percs slowly, wetness, large stones.	Wetness, large stones, rooting depth.
BuB---- Buchanan	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, percs slowly, wetness.	Percs slowly, rooting depth.	Percs slowly, rooting depth.
BuC, BuD---- Buchanan	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, percs slowly, wetness.	Slope, percs slowly, rooting depth.	Slope, percs slowly, rooting depth.
BxB---- Buchanan	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, percs slowly, wetness.	Percs slowly, rooting depth.	Percs slowly, rooting depth.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
BxD---------- Buchanan	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, percs slowly, wetness.	Slope, percs slowly, rooting depth.	Slope, percs slowly, rooting depth.
CaA---------- Cavode	Moderate: depth to rock.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
CaB---------- Cavode	Moderate: depth to rock, slope.	Severe: piping, wetness.	Severe: no water.	Slope, percs slowly, frost action.	Wetness, percs slowly, slope.	Wetness, percs slowly.	Wetness, percs slowly.
CaC---------- Cavode	Severe: slope.	Severe: piping, wetness.	Severe: no water.	Slope, percs slowly, frost action.	Wetness, percs slowly, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly, slope.
CdB---------- Cavode	Moderate: depth to rock, slope.	Severe: piping, wetness.	Severe: no water.	Slope, percs slowly, frost action.	Wetness, percs slowly, slope.	Wetness, percs slowly.	Wetness, percs slowly.
CdD---------- Cavode	Severe: slope.	Severe: piping, wetness.	Severe: no water.	Slope, percs slowly, frost action.	Wetness, percs slowly, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly, slope.
CoA---------- Cookport	Moderate: depth to rock.	Severe: piping.	Severe: no water.	Percs slowly---	Wetness, percs slowly, rooting depth.	Wetness, rooting depth.	Rooting depth, percs slowly.
CoB---------- Cookport	Moderate: depth to rock, slope.	Severe: piping.	Severe: no water.	Slope, percs slowly.	Wetness, percs slowly, slope.	Wetness, rooting depth.	Rooting depth, percs slowly.
CoC---------- Cookport	Severe: slope.	Severe: piping.	Severe: no water.	Slope, percs slowly.	Wetness, percs slowly, slope.	Slope, wetness, rooting depth.	Slope, rooting depth, percs slowly.
CpB---------- Cookport	Moderate: depth to rock, slope.	Severe: piping.	Severe: no water.	Slope, percs slowly.	Wetness, rooting depth, slope.	Wetness, percs slowly, rooting depth.	Rooting depth, percs slowly.
CpD---------- Cookport	Severe: slope.	Severe: piping.	Severe: no water.	Slope, percs slowly.	Wetness, rooting depth, slope.	Wetness, rooting depth, slope.	Slope, rooting depth, percs slowly.
HaB, HaC, HaD, HaF---------- Hartleton	Severe: seepage, slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
HeB---------- Hartleton	Severe: seepage.	Severe: piping, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Large stones---	Large stones, droughty.
HeD---------- Hartleton	Severe: seepage, slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
HoB---------- Hazleton	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Large stones, too sandy.	Large stones, droughty.
HoC, HoD---------- Hazleton	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones, too sandy.	Large stones, slope, droughty.
HxB---------- Hazleton	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Large stones, too sandy.	Large stones, droughty.
HxD, HxF, HyE----- Hazleton	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Large stones, slope, too sandy.	Large stones, slope, droughty.
LeB---------- Leck Kill	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Slope----------	Favorable------	Favorable.
LeC, LeD, LeF----- Leck Kill	Severe: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope----------	Slope----------	Slope.
NoA---------- Nolo	Moderate: depth to rock.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Percs slowly, wetness, rooting depth.	Wetness, percs slowly, rooting depth.
NoB---------- Nolo	Moderate: depth to rock, slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Percs slowly, wetness, rooting depth.	Wetness, percs slowly, rooting depth.
NxB---------- Nolo	Moderate: depth to rock, slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Wetness, rooting depth, percs slowly.	Wetness, percs slowly, rooting depth.
Ph---------- Philo	Severe: seepage.	Severe: piping.	Moderate: deep to water.	Flooding-------	Wetness, flooding.	Wetness--------	Favorable.
Po---------- Pope	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily	Erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ub*:							
Udifluvents	Severe: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action, slope.	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Buchanan	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, percs slowly, wetness.	Percs slowly, rooting depth.	Percs slowly, rooting depth.
Ud, Us Udorthents	Variable	Variable	Variable	Variable	Variable	Variable	Variable.
WaB Wharton	Moderate: depth to rock, slope.	Moderate: thin layer, piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly.	Percs slowly.
WaC, WaD Wharton	Severe: slope.	Moderate: thin layer, piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Wetness, slope, percs slowly.	Slope, percs slowly.
WxB Wharton	Moderate: depth to rock, slope.	Moderate: thin layer, piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly.	Percs slowly.
WxD Wharton	Severe: slope.	Moderate: thin layer, piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly, slope.	Percs slowly, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
AbB, AbC, AbD---- Albrights	0-8	Silt loam--------	ML, CL	A-4	0-10	80-100	80-95	70-90	55-80	16-30	5-10
	8-20	Channery clay loam, gravelly silt loam, silty clay loam.	ML, CL, SM, SC	A-4, A-6	0-15	80-100	65-95	60-90	40-85	25-40	3-15
	20-66	Silt loam, fine sandy loam, gravelly silty clay loam, channery clay loam, gravelly loamy sand.	CL, ML, SC, SC-SM	A-4, A-2, A-6	0-15	65-100	45-95	40-90	25-80	20-40	3-15
At---------- Atkins	0-9	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	60-95	20-40	3-20
	9-36	Silty clay loam, silt loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-5	90-100	85-100	65-100	45-85	20-40	3-20
	36-64	Stratified silty clay loam to gravelly sandy loam.	SM, CL, GM, ML	A-2, A-4, A-6	0-15	60-100	60-100	50-95	30-85	20-40	1-15
Ba---------- Barbour	0-7	Fine sandy loam	ML, CL-ML, SM, SC-SM	A-4, A-2	0	80-100	75-100	50-95	30-90	16-25	2-7
	7-30	Silt loam, fine sandy loam, gravelly loam.	ML, SM, CL-ML, SC-SM	A-4, A-2, A-1	0	60-100	55-95	30-95	15-85	16-25	2-7
	30-66	Loamy sand, very gravelly loamy sand, very channery loamy fine sand.	SM, SP, GM, GP	A-1, A-2, A-3, A-4	0-5	35-95	30-95	20-80	2-40	---	NP
Bb---------- Basher	0-8	Silt loam--------	ML, CL-ML, SM, SC-SM	A-4, A-2, A-1	0-5	80-100	75-100	45-100	20-90	16-25	2-7
	8-30	Silt loam, loam, fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2, A-1	0-5	75-100	70-100	40-100	20-90	16-25	2-7
	30-42	Silt loam, gravelly loam, fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2, A-1	0-5	75-100	70-100	40-100	20-90	16-25	2-7
	42-66	Fine sandy loam, gravelly loamy sand, very gravelly sand.	GP, SW, SM, ML	A-1, A-2, A-4, A-3	0-5	30-100	25-100	10-85	1-55	---	NP
BrA, BrB---------- Brinkerton	0-6	Silt loam--------	ML	A-4, A-6	0-10	90-100	85-100	85-100	75-100	---	---
	6-24	Silty clay loam, silt loam.	ML	A-4, A-6, A-7, A-5	0-10	90-100	85-100	85-100	65-100	30-45	5-15
	24-50	Channery silt loam, shaly loam, channery silty clay loam.	ML	A-4, A-6, A-7, A-5	0-10	75-100	60-100	60-100	55-100	30-45	5-15
	50-96	Silt loam, shaly loam, channery silt loam.	ML, SM, SC, CL	A-4, A-6, A-2, A-1	0-50	70-90	25-85	25-85	20-75	30-40	5-15

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
BsB---------- Brinkerton	0-6	Very stony silt loam.	ML	A-4, A-6	3-20	90-100	85-100	85-100	75-100	---	---
	6-24	Silty clay loam, silt loam.	ML	A-4, A-6, A-7, A-5	0-10	90-100	85-100	85-100	65-100	30-45	5-15
	24-50	Channery silt loam, shaly loam, channery silty clay loam.	ML	A-4, A-6, A-7, A-5	0-10	75-100	60-100	60-100	55-100	30-45	5-15
	50-96	Silt loam, shaly loam, channery silt loam.	ML, SM, SC, CL	A-4, A-6, A-2, A-1	0-50	70-90	25-85	25-85	20-75	30-40	5-15
BuB, BuC, BuD---- Buchanan	0-10	Silt loam--------	ML, CL, CL-ML	A-4	0-5	90-100	85-100	75-90	65-85	20-35	2-11
	10-25	Silt loam, gravelly loam, gravelly sandy clay loam.	GM, ML, CL, SM	A-4, A-2	0-20	50-100	45-90	40-90	20-80	20-35	2-15
	25-66	Channery loam, loam, channery clay loam.	GM, ML, CL, SM	A-4, A-2, A-6	0-20	50-100	30-80	30-75	20-60	20-35	2-15
BxB, BxD---------- Buchanan	0-10	Very stony silt loam.	GM, ML, CL, CL-ML	A-2, A-4	3-20	50-90	45-75	40-75	30-65	20-35	2-11
	10-25	Silt loam, gravelly sandy clay loam.	GM, ML, CL, SM	A-2, A-4	0-20	50-100	45-90	40-90	20-80	20-35	2-15
	25-66	Channery loam, loam, channery clay loam.	GM, ML, CL, SM	A-2, A-4, A-6	0-20	50-100	30-80	30-75	20-60	20-35	2-15
CaA, CaB, CaC---- Cavode	0-8	Silt loam--------	ML, CL	A-4	0-5	90-100	80-100	80-95	75-95	---	---
	8-26	Silty clay loam, silty clay.	ML, CL, CL-ML	A-4, A-7, A-6	0-5	85-100	80-100	80-95	70-95	25-50	4-20
	26-58	Shaly silty clay loam, silty clay.	ML, CL, GC, GM	A-2, A-4, A-6	0-45	50-100	35-100	30-80	25-75	25-45	2-15
	58-62	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CdB, CdD---------- Cavode	0-8	Very stony silt loam.	ML, CL	A-4	3-15	90-100	80-100	80-95	75-95	---	---
	8-26	Silty clay loam, silty clay.	ML, CL, CL-ML	A-4, A-7, A-6	0-5	85-100	80-100	80-95	70-95	25-50	4-20
	26-58	Shaly silty clay loam, silty clay.	ML, CL, GC, GM	A-2, A-4, A-6	0-45	50-100	35-100	30-80	25-75	25-45	2-15
	58-62	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
CoA, CoB, CoC---- Cookport	0-8	Channery loam----	ML, CL, SM, SC	A-2, A-4, A-6	0-15	75-100	60-70	50-60	30-55	20-40	1-15
	8-23	Sandy clay loam, clay loam, channery loam.	ML, CL, SM, SC	A-4, A-6	0-15	85-100	65-100	55-95	40-75	20-40	4-20
	23-40	Channery sandy clay loam, clay loam, channery loam.	ML, CL, SM, SC	A-4, A-6	0-15	85-100	65-100	55-95	40-75	20-40	4-20
	40-46	Very channery sandy loam, channery sandy clay loam.	ML, CL, SC-SM, GM-GC	A-2, A-4, A-6	0-15	60-100	50-95	40-95	30-75	20-40	1-15
	46-50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CpB, CpD---------- Cookport	0-8	Very stony loam	ML, CL, SM, SC	A-2, A-4, A-6	2-40	75-95	60-70	50-60	30-55	20-40	1-15
	8-23	Sandy clay loam, clay loam, channery loam.	ML, CL, SM, SC	A-4, A-6	0-15	85-100	65-100	55-95	40-75	20-40	4-20
	23-40	Channery sandy clay loam, clay loam, channery loam.	ML, CL, SM, SC	A-4, A-6	0-15	85-100	65-100	55-95	40-75	20-40	4-20
	40-46	Very channery sandy loam, channery sandy clay loam.	ML, CL, SC-SM, GM-GC	A-2, A-4, A-6	0-15	60-100	50-95	40-95	30-75	20-40	1-15
	46-50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HaB, HaC, HaD, HaF---------- Hartleton	0-5	Channery silt loam.	SM, ML	A-4	10-20	80-95	70-90	60-90	45-80	---	---
	5-37	Very channery silt loam, extremely channery silt loam, channery silty clay loam.	GM, ML, SM	A-2, A-4	25-65	60-90	45-80	40-80	30-75	20-30	NP-7
	37-46	Extremely channery loam, very shaly silt loam.	SM, GM, ML	A-1, A-2, A-4	55-85	40-80	25-70	20-70	15-60	20-30	NP-7
	46-50	Weathered bedrock	---	---	---	---	---	---	---	---	---
HeB, HeD---------- Hartleton	0-5	Very stony silt loam.	SM, ML	A-4	20-40	80-95	70-90	60-90	35-80	---	---
	5-37	Very channery silt loam, extremely channery silt loam, channery silty clay loam.	GM, ML, SM	A-2, A-4	25-65	60-90	45-80	40-80	30-75	20-30	NP-7
	37-46	Extremely channery loam, very channery silt loam.	SM, GM, ML	A-1, A-2, A-4	55-85	40-80	25-70	20-70	15-60	20-30	NP-7
	46-50	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
HoB, HoC, HoD---- Hazleton	0-6	Channery loam----	ML, GM, SM	A-2, A-4	0-15	60-85	60-80	60-75	35-55	---	---
	6-36	Channery sandy loam, loam, very channery sandy loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-50	60-95	45-90	35-70	20-55	<30	NP-8
	36-54	Channery loam, very channery sandy loam, extremely channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	0-60	55-80	35-75	25-65	15-50	<30	NP-8
	54-58	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HxB, HxD, HxF---- Hazleton	0-6	Very stony loam	ML, GM, SM	A-4, A-2	5-15	60-85	50-80	50-70	35-55	---	---
	6-36	Channery sandy loam, very channery sandy loam, loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-50	60-95	45-90	35-70	20-55	<30	NP-8
	36-54	Channery loam, very channery sandy loam, extremely channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	5-60	50-80	35-75	25-65	15-50	<30	NP-8
	54-58	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HyE---------- Hazleton	0-6	Extremely bouldery loam.	GM, SM, ML	A-4, A-2	15-50	60-85	50-80	50-70	35-55	---	---
	6-36	Channery sandy loam, very channery sandy loam, loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-50	60-95	45-90	35-70	20-55	<30	NP-8
	36-54	Channery loam, very channery sandy loam, extremely channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	5-60	55-80	35-75	25-65	15-50	<30	NP-8
	54-58	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LeB, LeC, LeD, LeF---------- Leck Kill	0-5	Channery silt loam.	SM, ML, GM	A-2, A-4	0-5	70-85	60-80	50-80	35-70	---	---
	5-28	Channery silt loam, channery loam, shaly silty clay loam.	GM, SC, GC, CL	A-4, A-2, A-6	0-10	60-90	50-85	40-80	30-70	23-40	2-17
	28-46	Extremely channery silt loam, very channery clay loam, very shaly loam.	SM, GM, GP-GM, SP-SM	A-2, A-1	0-30	30-70	10-30	8-30	6-25	25-40	2-13
	46-50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
NoA, NoB	0-9	Loam	ML	A-4	0-5	90-100	90-100	80-100	55-90	---	---
Nolo	9-20	Silt loam, channery clay loam, channery sandy clay loam.	ML, CL-ML	A-4, A-6	0-15	80-100	80-100	80-95	55-85	25-40	4-11
	20-45	Loam, channery sandy clay loam, sandy clay loam.	CL-ML, GC, SC, CL	A-4, A-6	0-15	60-100	60-90	55-85	35-70	25-35	4-11
	45-49	Weathered bedrock	---	---	---	---	---	---	---	---	---
NxB	0-9	Very stony loam	ML	A-4	3-15	75-100	75-100	70-100	60-90	---	---
Nolo	9-20	Silt loam, channery clay loam, channery sandy clay loam.	ML, CL-ML	A-6, A-4	0-15	80-100	80-100	80-95	55-85	25-40	4-11
	20-45	Loam, channery sandy clay loam, sandy clay loam.	CL-ML, GC, SC, CL	A-4, A-6	0-15	60-100	60-90	55-85	35-70	25-35	4-11
	45-49	Weathered bedrock	---	---	---	---	---	---	---	---	---
Ph	0-7	Silt loam	ML, SM, CL-ML	A-4	0-5	95-100	80-100	75-90	60-80	20-35	1-10
Philo	7-40	Silt loam, loam, channery sandy loam.	ML, SM, CL-ML	A-4	0-5	95-100	75-100	70-90	45-80	20-35	1-10
	40-72	Stratified sand to silt loam.	GM, SM, ML, CL-ML	A-2, A-4	0-5	60-95	50-90	40-85	30-80	16-30	1-10
Po	0-9	Silt loam	ML, CL, SM, CL-ML	A-4	0	85-100	75-100	70-100	45-90	<30	NP-10
Pope	9-40	Fine sandy loam, sandy loam, loam.	SM, SC-SM, ML, CL-ML	A-2, A-4	0	95-100	80-100	51-95	25-75	<30	NP-7
	40-66	Sandy loam, gravelly sandy loam, very gravelly sandy loam.	SM, SC-SM, ML, GM	A-2, A-1, A-4	0-20	45-100	35-100	30-95	15-70	<30	NP-7
Ub*:											
Udifluvents	0-7	Gravelly sandy loam.	ML, CL-ML, SC-SM, SM	A-4	0-5	75-100	60-100	50-80	35-60	16-20	NP-5
	7-42	Sandy loam, silt loam, gravelly loam.	ML, CL-ML, SC-SM, SM	A-4	0-10	75-100	60-100	50-90	35-80	16-25	NP-6
	42-60	Silt loam, loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	80-100	50-95	16-40	2-25
Buchanan	0-10	Silt loam	ML, CL, CL-ML	A-4	0-5	90-100	85-100	75-90	65-85	20-35	2-11
	10-25	Gravelly loam, silt loam, gravelly sandy clay loam.	GM, ML, CL, SM	A-4, A-2	0-20	50-100	45-90	40-90	20-80	20-35	2-15
	25-66	Channery loam, loam, channery clay loam.	GM, ML, CL, SM	A-4, A-2, A-6	0-20	50-100	30-80	30-75	20-60	20-35	2-15

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
Ud Udorthents	0-10	Very channery loam.	GC, GM, CL, SC-SM	A-1, A-2, A-4	0-20	40-80	30-70	20-65	15-60	16-25	NP-10
	10-60	Very shaly silt loam, very channery sandy loam, shaly loam.	GW-GM, SC-SM, GC, GM	A-1, A-2	0-45	25-80	20-50	10-30	5-30	16-40	NP-15
Us Udorthents	0-10	Very channery loam.	GC, GM, CL, SC-SM	A-1, A-2, A-4	30-60	40-80	30-70	20-65	15-60	16-25	NP-10
	10-60	Very shaly silt loam, very channery sandy loam, very shaly loam.	GW-GM, SC-SM, GC, GM	A-1, A-2	40-70	25-80	20-50	10-30	5-30	16-40	NP-15
WaB, WaC, WaD Wharton	0-7	Silt loam	ML, CL	A-4, A-6	0-5	95-100	90-100	80-95	70-90	---	---
	7-44	Clay loam, silty clay loam, channery silty clay loam.	ML, CL	A-7, A-6	0-25	75-100	70-100	65-95	60-90	35-45	10-25
	44-56	Silt loam, shaly clay, very shaly silt loam.	ML, GM, SM	A-4, A-6, A-7, A-2	0-50	45-100	30-100	25-95	25-90	30-45	5-15
	56-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
WxB, WxD Wharton	0-7	Very stony silt loam.	ML, CL	A-4, A-6	5-15	70-100	65-100	60-95	55-90	---	---
	7-44	Clay loam, silty clay loam, channery silty clay loam.	ML, CL	A-7, A-6	0-25	75-100	70-100	65-95	60-90	35-55	10-25
	44-56	Silt loam, shaly clay, very channery silty clay loam.	ML, GM, SM	A-4, A-6, A-7	0-50	45-100	30-100	25-95	25-90	30-45	5-15
	56-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
AbB, AbC, AbD----	0-8	15-27	1.20-1.40	0.6-2.0	0.16-0.20	3.6-5.5	Low----------	0.32	3	1-4
Albrights	8-20	18-35	1.30-1.50	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.28		
	20-66	18-35	1.40-1.70	0.2-0.6	0.04-0.08	4.5-6.5	Low----------	0.28		
At----------	0-9	18-30	1.20-1.40	0.6-2.0	0.14-0.22	4.5-5.5	Low----------	0.32	4	2-4
Atkins	9-36	18-35	1.20-1.50	0.06-2.0	0.14-0.18	4.5-5.5	Low----------	0.32		
	36-64	10-35	1.20-1.50	0.2-6.0	0.08-0.18	4.5-5.5	Low----------	0.28		
Ba----------	0-7	6-18	1.15-1.40	0.6-2.0	0.16-0.21	4.5-6.0	Low----------	0.32	5	1-5
Barbour	7-30	6-18	1.15-1.45	2.0-6.0	0.10-0.19	4.5-6.0	Low----------	0.32		
	30-66	1-8	1.25-1.55	6.0-20	0.02-0.07	4.5-6.5	Low----------	0.17		
Bb----------	0-8	6-18	1.15-1.40	0.6-2.0	0.15-0.21	3.6-6.0	Low----------	0.32	5	1-5
Basher	8-30	6-18	1.15-1.45	0.6-2.0	0.10-0.19	3.6-6.0	Low----------	0.32		
	30-42	6-18	1.25-1.55	0.2-2.0	0.10-0.19	4.5-6.5	Low----------	0.32		
	42-66	1-8	1.25-1.55	0.6-6.0	0.02-0.07	4.5-6.5	Low----------	0.17		
BrA, BrB----------	0-6	15-30	1.20-1.40	0.6-2.0	0.18-0.24	4.5-6.0	Low----------	0.32	3	1-4
Brinkerton	6-24	15-35	1.20-1.50	0.6-2.0	0.14-0.18	4.5-6.0	Moderate-----	0.37		
	24-50	15-35	1.40-1.70	0.06-0.2	0.08-0.12	4.5-6.0	Moderate-----	0.32		
	50-96	15-25	1.20-1.55	0.06-0.6	0.14-0.18	5.1-6.5	Low----------	0.20		
BsB----------	0-6	15-35	1.20-1.40	0.6-2.0	0.18-0.24	4.5-6.0	Low----------	0.24	3	---
Brinkerton	6-24	15-35	1.20-1.50	0.6-2.0	0.14-0.18	4.5-6.0	Moderate-----	0.37		
	24-50	15-35	1.40-1.70	0.06-0.2	0.08-0.12	4.5-6.0	Moderate-----	0.32		
	50-96	15-25	1.20-1.55	0.06-0.6	0.14-0.18	5.1-6.5	Low----------	0.20		
BuB, BuC, BuD----	0-10	10-27	1.20-1.40	0.6-2.0	0.14-0.20	3.6-5.5	Low----------	0.32	3	1-3
Buchanan	10-25	18-30	1.30-1.60	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.24		
	25-66	18-35	1.40-1.70	0.06-0.2	0.06-0.10	3.6-5.5	Low----------	0.17		
BxB, BxD----------	0-10	10-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.24	3	---
Buchanan	10-25	18-30	1.30-1.60	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.24		
	25-66	18-35	1.40-1.70	0.06-0.2	0.06-0.10	3.6-5.5	Low----------	0.17		
CaA, CaB, CaC----	0-8	15-35	1.20-1.40	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.37	3	2-4
Cavode	8-26	35-45	1.20-1.50	0.06-0.2	0.10-0.14	4.5-5.5	Moderate-----	0.24		
	26-58	35-45	1.20-1.50	0.06-0.2	0.08-0.12	4.5-5.5	Moderate-----	0.24		
	58-62	---	---	---	---	---	----------	----		
CdB, CdD----------	0-8	15-27	1.20-1.40	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.28	3	---
Cavode	8-26	35-45	1.20-1.50	0.06-0.2	0.10-0.14	4.5-5.5	Moderate-----	0.28		
	26-58	35-45	1.20-1.50	0.06-0.2	0.08-0.12	4.5-5.5	Moderate-----	0.28		
	58-62	---	---	---	---	---	----------	----		
CoA, CoB, CoC----	0-8	10-27	1.20-1.40	0.6-2.0	0.12-0.16	4.5-5.5	Low----------	0.24	3	1-4
Cookport	8-23	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	23-40	18-35	1.40-1.70	0.06-0.2	0.08-0.12	3.6-5.5	Low----------	0.24		
	40-46	10-27	1.20-1.50	0.2-0.6	0.08-0.12	3.6-5.5	Low----------	0.24		
	46-50	---	---	---	---	---	----------	----		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
CpB, CpD--------- Cookport	0-8 8-23 23-40 40-46 46-50	10-27 18-35 18-35 10-27 ---	1.20-1.40 1.20-1.50 1.40-1.70 1.20-1.50 ---	0.6-2.0 0.6-2.0 0.06-0.2 0.2-0.6 ---	0.12-0.16 0.12-0.16 0.08-0.12 0.08-0.12 ---	4.5-5.5 3.6-5.5 3.6-5.5 3.6-5.5 ---	Low Low Low Low ---	0.24 0.24 0.24 0.24 ---	3	---
HaB, HaC, HaD, HaF--------- Hartleton	0-5 5-37 37-46 46-50	10-25 15-27 15-27 ---	1.20-1.40 1.40-1.60 1.40-1.60 ---	0.6-6.0 0.6-6.0 0.6-6.0 ---	0.10-0.14 0.06-0.10 0.04-0.08 ---	4.5-5.5 4.5-5.5 4.5-5.5 ---	Low Low Low ---	0.20 0.20 0.20 ---	3	1-3
HeB, HeD--------- Hartleton	0-5 5-37 37-46 46-50	10-25 15-27 15-27 ---	1.20-1.40 1.40-1.60 1.40-1.60 ---	0.6-6.0 0.6-6.0 0.6-6.0 ---	0.10-0.14 0.06-0.10 0.04-0.08 ---	4.5-5.5 4.5-5.5 4.5-5.5 ---	Low Low Low ---	0.15 0.20 0.20 ---	3	---
HoB, HoC, HoD---- Hazleton	0-6 6-36 36-54 54-58	7-18 7-18 5-15 ---	1.20-1.40 1.20-1.40 1.20-1.40 ---	2.0-6.0 2.0-20 2.0-20 ---	0.10-0.14 0.08-0.12 0.06-0.12 ---	3.6-5.5 3.6-5.5 3.6-5.5 ---	Low Low Low ---	0.17 0.15 0.15 ---	3	2-4
HxB, HxD, HxF, HyE--------- Hazleton	0-6 6-36 36-54 54-58	7-18 7-18 5-15 ---	1.20-1.40 1.20-1.40 1.20-1.40 ---	2.0-6.0 2.0-20 2.0-20 ---	0.10-0.16 0.08-0.12 0.06-0.12 ---	3.6-5.5 3.6-5.5 3.6-5.5 ---	Low Low Low ---	0.15 0.15 0.15 ---	3	2-4
LeB, LeC, LeD, LeF--------- Leck Kill	0-5 5-28 28-46 46-50	10-20 17-32 17-32 ---	1.20-1.50 1.40-1.70 1.30-1.60 ---	0.6-6.0 0.6-6.0 0.6-6.0 ---	0.14-0.18 0.12-0.16 0.04-0.08 ---	4.5-7.3 4.5-7.3 4.5-6.0 ---	Low Low Low ---	0.24 0.24 0.17 ---	3	1-3
NoA, NoB--------- Nolo	0-9 9-20 20-45 45-49	10-20 18-35 18-35 ---	1.20-1.40 1.30-1.40 1.30-1.60 ---	0.6-2.0 0.6-2.0 0.06-0.2 ---	0.16-0.20 0.12-0.16 0.06-0.10 ---	3.6-5.0 3.6-5.0 3.6-5.0 ---	Low Low Low ---	0.32 0.32 0.17 ---	3	1-3
NxB--------- Nolo	0-9 9-20 20-45 45-49	10-20 18-35 18-35 ---	1.20-1.40 1.30-1.50 1.30-1.60 ---	0.6-2.0 0.6-2.0 0.06-0.2 ---	0.14-0.20 0.12-0.16 0.06-0.10 ---	3.6-5.0 3.6-5.0 3.6-5.0 ---	Low Low Low ---	0.24 0.28 0.17 ---	3	---
Ph--------- Philo	0-7 7-40 40-72	10-18 10-18 5-18	1.20-1.40 1.20-1.40 1.20-1.40	0.6-2.0 0.6-2.0 2.0-6.0	0.14-0.20 0.10-0.20 0.06-0.10	4.5-6.0 4.5-6.0 4.5-6.0	Low Low Low	0.37 0.32 0.24	5	2-4
Po--------- Pope	0-9 9-40 40-66	5-15 5-18 5-20	1.20-1.40 1.30-1.60 1.30-1.60	0.6-2.0 0.6-6.0 0.6-6.0	0.14-0.23 0.10-0.18 0.10-0.18	3.6-5.5 3.6-5.5 3.6-5.5	Low Low Low	0.37 0.28 0.28	5	1-4
Ub*: Udifluvents----- Buchanan-------- 	0-7 7-42 42-60 0-10 10-25 25-66	5-15 5-20 18-35 10-27 18-30 18-35	1.00-1.40 1.00-1.45 1.20-1.40 1.20-1.40 1.30-1.60 1.40-1.70	0.6-2.0 0.6-6.0 0.6-2.0 0.6-2.0 0.6-2.0 0.06-0.2	0.10-0.15 0.06-0.12 0.08-0.14 0.14-0.20 0.10-0.16 0.06-0.10	3.6-7.3 3.6-7.3 4.5-6.5 3.6-5.5 3.6-5.5 3.6-5.5	Low Low Low Low Low Low	0.43 0.37 0.32 0.32 0.24 0.17	5 3 	1-3 1-3

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
Ud	0-10	8-27	0.90-1.30	0.2-6.0	0.02-0.06	4.5-8.4	Low	0.17	5-3	1-5
Udorthents	10-60	6-50	1.00-1.60	0.06-20	0.01-0.08	4.5-8.4	Low	0.17		
Us	0-10	8-27	1.20-1.50	2.0-6.0	0.01-0.04	4.5-8.4	Low	0.10	5-3	.5-1
Udorthents	10-60	6-50	1.30-1.60	2.0-20	0.01-0.05	4.5-8.4	Low	0.10		
WaB, WaC, WaD	0-7	15-25	1.10-1.30	0.6-2.0	0.16-0.20	4.0-5.5	Low	0.37	3	1-4
Wharton	7-44	15-35	1.20-1.50	0.06-0.6	0.12-0.16	4.0-5.5	Moderate	0.24		
	44-56	20-45	1.20-1.60	0.06-0.6	0.08-0.12	3.6-5.5	Moderate	0.17		
	56-60	---	---	---	---	---	---	----		
WxB, WxD	0-7	15-35	1.10-1.30	0.6-2.0	0.14-0.20	4.5-5.5	Low	0.28	3	---
Wharton	7-44	15-35	1.20-1.50	0.06-0.6	0.12-0.16	4.5-5.5	Moderate	0.24		
	44-56	20-45	1.20-1.60	0.06-0.6	0.08-0.12	3.6-5.0	Moderate	0.24		
	56-60	---	---	---	---	---	---	----		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AbB, AbC, AbD--- Albrights	C	None	---	---	0.5-3.0	Perched	Nov-Mar	>60	---	Moderate	High	High.
At Atkins	D	Frequent	Very brief	Sep-Jul	0-1.0	Apparent	Nov-Jun	>60	---	High	High	Moderate.
Ba Barbour	B	Rare	---	---	3.0-6.0	Apparent	Jan-Apr	>60	---	Moderate	Low	Moderate.
Bb Basher	B	Occasional	Brief	Dec-Apr	1.5-2.0	Apparent	Jan-May	>60	---	High	Moderate	Moderate.
BrA, BrB, BsB--- Brinkerton	D	None	---	---	0-0.5	Perched	Oct-May	>60	---	High	High	High.
BuB, BuC, BuD, BxB, BxD Buchanan	C	None	---	---	1.5-3.0	Perched	Nov-Mar	>60	---	Moderate	High	High.
CaA, CaB, CaC, CdB, CdD Cavode	C	None	---	---	0.5-1.5	Perched	Oct-May	40-72	Soft	High	High	High.
CoA, CoB, CoC, CpB, CpD Cookport	C	None	---	---	1.5-2.5	Perched	Dec-Apr	40-72	Hard	Moderate	Moderate	Moderate.
HaB, HaC, HaD, HaF, HeB, HeD-- Hartleton	B	None	---	---	>6.0	---	---	40-60	Soft	Moderate	Low	High.
HoB, HoC, HoD, HxB, HxD, HxF, HyE Hazleton	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Low	High.
LeB, LeC, LeD, LeF Leck Kill	B	None	---	---	>6.0	---	---	40-60	Soft	Moderate	Low	Moderate.
NoA, NoB, NxB--- Nolo	D	None	---	---	0-0.5	Perched	Sep-Jun	40-60	Soft	High	High	High.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Ph Philo	B	Occasional	Brief	Dec-May	1.5-3.0	Apparent	Dec-Apr	>60	Hard	Moderate	Low	High.
Po Pope	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
Ub*:												
Udifluvents	D	Occasional	Very brief	Sep-Jul	0-1.0	Apparent	Oct-May	>60	---	High	High	High.
Buchanan	C	None	---	---	1.5-3.0	Perched	Nov-Mar	>60	---	Moderate	High	High.
Ud Udorthents	B/D	None	---	---	>6.0	---	---	20-60	Hard	Low	High	High.
Us Udorthents	A	None	---	---	>6.0	---	---	>60	---	Low	High	High.
WaB, WaC, WaD, WxB, WxD Wharton	C	None	---	---	1.5-3.0	Perched	Nov-Mar	>40	Soft	High	High	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Albrights	Fine-loamy, mixed, mesic Aquic Fragiudalfs
Atkins	Fine-loamy, mixed, acid, mesic Typic Fluvaquents
Barbour	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Fluventic Dystrochrepts
Basher	Coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts
Brinkerton	Fine-silty, mixed, mesic Typic Fragiaqualfs
Buchanan	Fine-loamy, mixed, mesic Aquic Fragiudults
Cavode	Clayey, mixed, mesic Aeric Ochraquults
Cookport	Fine-loamy, mixed, mesic Aquic Fragiudults
Hartleton	Loamy-skeletal, mixed, mesic Typic Hapludults
Hazleton	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Leck Kill	Fine-loamy, mixed, mesic Typic Hapludults
Nolo	Fine-loamy, mixed, mesic Typic Fragiaquults
Philo	Coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts
Pope	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts
Udifluvents	Udifluvents
Udorthents	Udorthents
Wharton	Fine-loamy, mixed, mesic Aquic Hapludults

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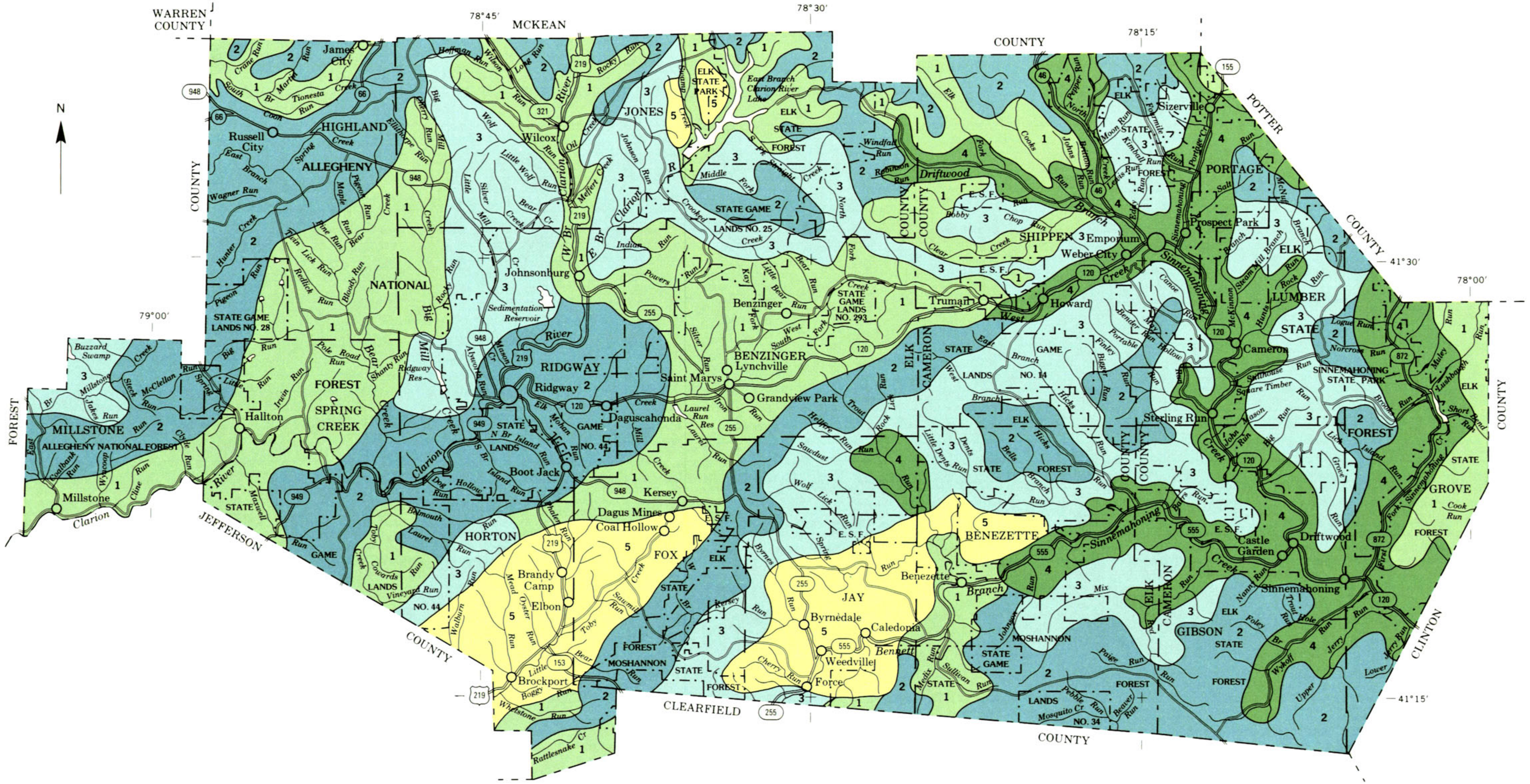


SOIL LEGEND

1	HAZLETON-BUCHANAN-COOKPORT ASSOCIATION: Very deep and deep, moderately well drained and well drained, nearly level to steep soils; formed in materials weathered from sandstone and siltstone; on uplands
2	HAZLETON-COOKPORT-BUCHANAN ASSOCIATION: Very deep and deep, moderately well drained and well drained, nearly level to very steep soils; formed in materials weathered from sandstone and siltstone; on uplands
3	HARTLETON-WHARTON-BUCHANAN ASSOCIATION: Very deep and deep, moderately well drained and well drained, gently sloping to very steep soils; formed in materials weathered from siltstone and shale; on uplands
4	LECK KILL-HARTLETON-ALBRIGHTS ASSOCIATION: Very deep and deep, somewhat poorly drained to well drained, nearly level to very steep soils; formed in materials weathered from shale, sandstone, and siltstone; on uplands
5	HARTLETON-WHARTON-UDORTHENTS ASSOCIATION: Very deep and deep, moderately well drained and well drained, nearly level to very steep soils; formed in materials weathered from shale, sandstone, and siltstone; on uplands

Compiled 1991

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
AGRICULTURAL EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE OF THE COLLEGE OF AGRICULTURE
PENNSYLVANIA STATE UNIVERSITY
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
PENNSYLVANIA DEPARTMENT OF AGRICULTURE

GENERAL SOIL MAP

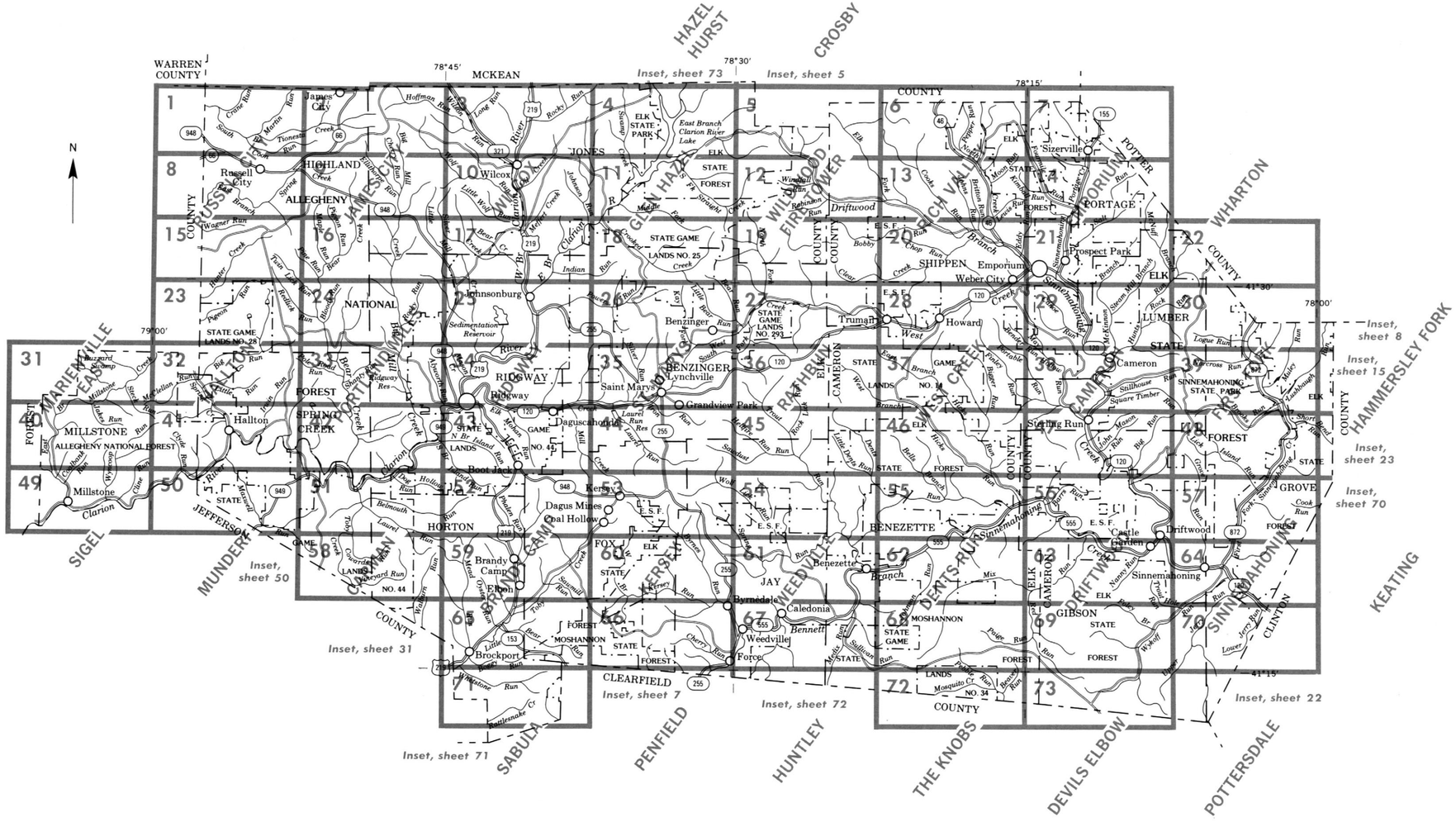
CAMERON AND ELK COUNTIES, PENNSYLVANIA

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



Original text from each individual map sheet read:
This soil survey map was compiled by the U.S. Department of Agriculture. Soil Conservation Service, and Cooperating Agencies. Base Maps are prepared from 1973-1977 orthophotography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

INDEX TO MAP SHEETS

CAMERON AND ELK COUNTIES, PENNSYLVANIA

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CAMERON AND ELK COUNTIES, PENNSYLVANIA

AGRICULTURAL EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE OF THE COLLEGE OF AGRICULTURE
PENNSYLVANIA STATE UNIVERSITY
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
PENNSYLVANIA DEPARTMENT OF AGRICULTURE

SOIL LEGEND

Publication symbols consist of letters. The first letter, always a capital, is the initial letter of the soil name. The second letter separates map units, except that it does not separate slope phases. The third letter, always a capital A, B, C, D, E, or F, indicates the slope. Symbols without a slope letter are for nearly level soils or for soils named at categories above the series.

SYMBOL	NAME
AbB	Albrights silt loam, 3 to 8 percent slopes
AbC	Albrights silt loam, 8 to 15 percent slopes
AbD	Albrights silt loam, 15 to 25 percent slopes
At	Atkins silt loam
Ba	Barbour fine sandy loam
Bb	Basher silt loam
BrA	Brinkerton silt loam, 0 to 3 percent slopes
BrB	Brinkerton silt loam, 3 to 8 percent slopes
BsB	Brinkerton silt loam, 0 to 8 percent slopes, very stony
BuB	Buchanan silt loam, 3 to 8 percent slopes
BuC	Buchanan silt loam, 8 to 15 percent slopes
BuD	Buchanan silt loam, 15 to 25 percent slopes
BxB	Buchanan silt loam, 0 to 8 percent slopes, very stony
BxD	Buchanan silt loam, 8 to 25 percent slopes, very stony
CaA	Cavode silt loam, 0 to 3 percent slopes
CaB	Cavode silt loam, 3 to 8 percent slopes
CaC	Cavode silt loam, 8 to 15 percent slopes
CdB	Cavode silt loam, 0 to 8 percent slopes, very stony
CdD	Cavode silt loam, 8 to 25 percent slopes, very stony
CoA	Cookport channery loam, 0 to 3 percent slopes
CoB	Cookport channery loam, 3 to 8 percent slopes
CoC	Cookport channery loam, 8 to 15 pecent slopes
CpB	Cookport channery loam, 0 to 8 percent slopes, very stony
CpD	Cookport channery loam, 8 to 25 percent slopes, very stony
HaB	Hartleton channery silt loam, 3 to 8 percent slopes
HaC	Hartleton channery silt loam, 8 to 15 percent slopes
HaD	Hartleton channery silt loam, 15 to 25 percent slopes
HaF	Hartleton channery silt loam, 25 to 60 percent slopes
HeB	Hartleton channery silt loam, 0 to 8 percent slopes, very stony
HeD	Hartleton channery silt loam, 8 to 25 percent slopes, very stony
HoB	Hazleton channery loam, 3 to 8 percent slopes
HoC	Hazleton channery loam, 8 to 15 percent slopes
HoD	Hazleton channery loam, 15 to 25 percent slopes
HxB	Hazleton channery loam, 0 to 8 percent slopes, very stony
HxD	Hazleton channery loam, 8 to 25 percent slopes, very stony
HxF	Hazleton channery loam, 25 to 60 percent slopes, very stony
HyE	Hazleton channery loam, 8 to 35 percent slopes, extremely bouldery
LeB	Leck Kill channery silt loam, 3 to 8 percent slopes
LeC	Leck Kill channery silt loam, 8 to 15 percent slopes
LeD	Leck Kill channery silt loam, 15 to 25 percent slopes
LeF	Leck Kill channery silt loam, 25 to 60 percent slopes
NoA	Nolo loam, 0 to 3 percent slopes
NoB	Nolo loam, 3 to 8 percent slopes
NxB	Nolo loam, 0 to 8 percent slopes, very stony
Ph	Philo silt loam
Po	Pope silt loam
Ub	Udifluvents-Buchanan complex
Ud	Udorthents, sandstone and shale
Us	Udorthents, sandstone and shale, smoothed
WaB	Wharton silt loam, 3 to 8 percent slopes
WaC	Wharton silt loam, 8 to 15 percent slopes
WaD	Wharton silt loam, 15 to 25 percent slopes
WxB	Wharton silt loam, 0 to 8 percent slopes, very stony
WxD	Wharton silt loam, 8 to 25 percent slopes, very stony

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline
- AD HOC BOUNDARY (label)
- Small airport, airfield, park, oilfield, cemetery, or flood pool (Swift Airport; FLOOD POOL LINE)
- STATE COORDINATE TICK
- LAND DIVISION CORNER (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate (21)
- Federal (173)
- State (28)
- County, farm or ranch (1283)

- RAILROAD
- POWER TRANSMISSION LINE (normally not shown)
- PIPE LINE (normally not shown)
- FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or Small (water; w)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (Gas)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
- Double-line (label) (CANAL)
- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; w)
- Intermittent (int; i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

- SOIL DELINEATIONS AND SYMBOLS (At; Bb)
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE (normally not shown) (S)
- MISCELLANEOUS
  - Blowout
  - Clay spot
  - Gravelly spot
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Rock outcrop (includes sandstone and shale)
  - Saline spot
  - Sandy spot
  - Severely eroded spot
  - Slide or slip (tips point upslope)
  - Stony spot, very stony spot

SOIL SURVEY OF CAMERON AND ELK COUNTIES, PENNSYLVANIA — SHEET NUMBER 1

N

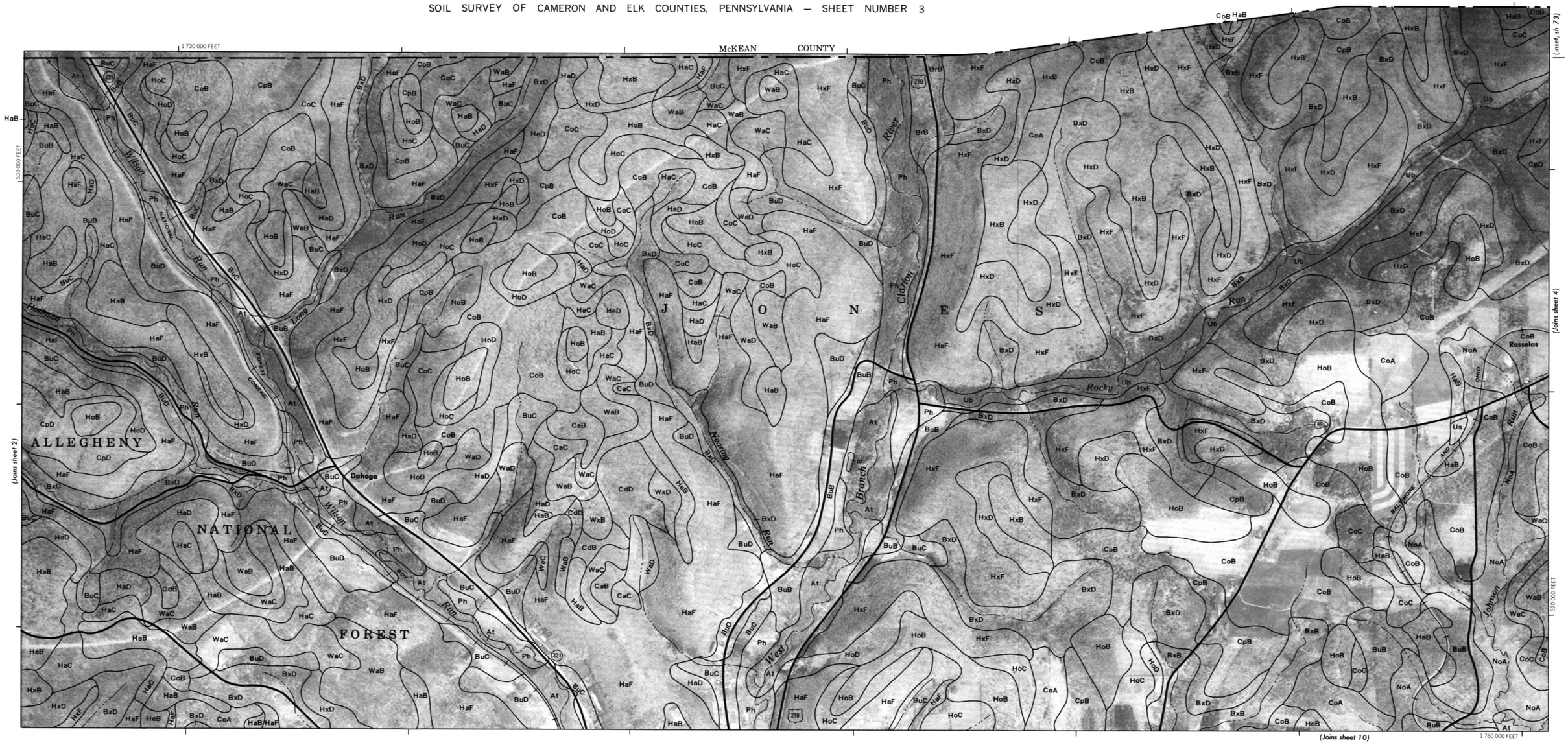
SOIL SURVEY OF CAMERON AND ELK COUNTIES, PENNSYLVANIA — SHEET NUMBER 2

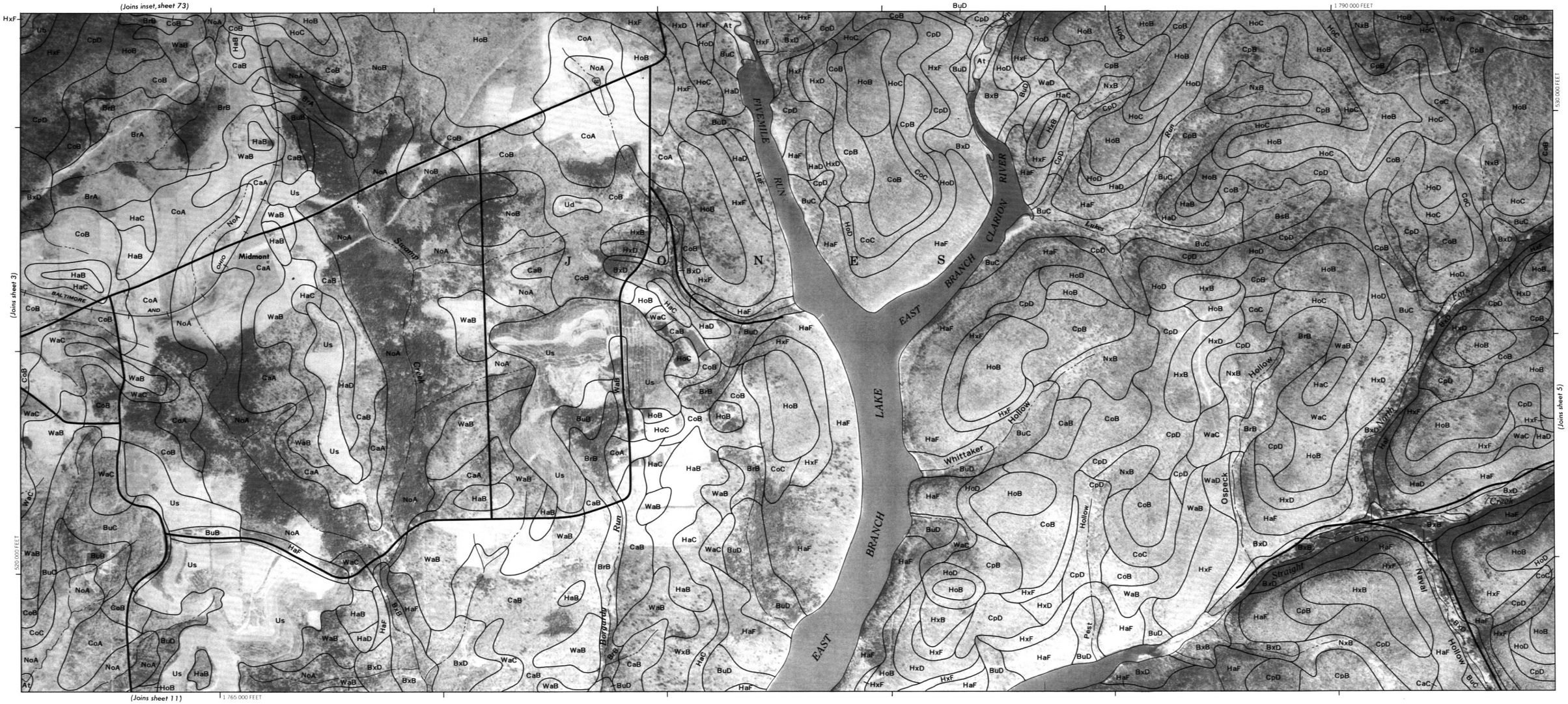
1 — 3/4 — 1/2 — 1/4 — 0 — 1 MILE

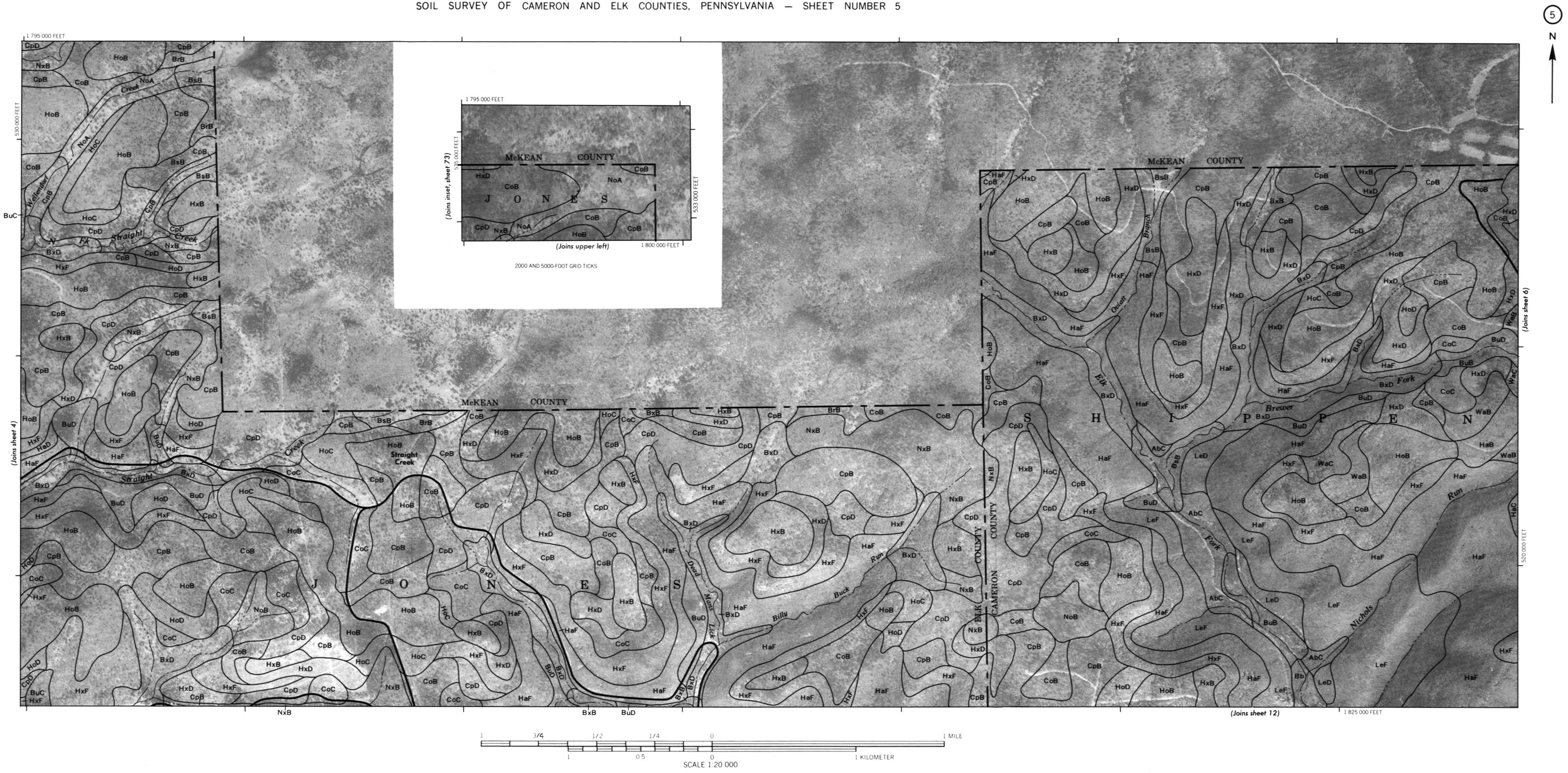
1 — 0.5 — 0 — 1 KILOMETER

SCALE 1:20 000

SOIL SURVEY OF CAMERON AND ELK COUNTIES, PENNSYLVANIA — SHEET NUMBER 3

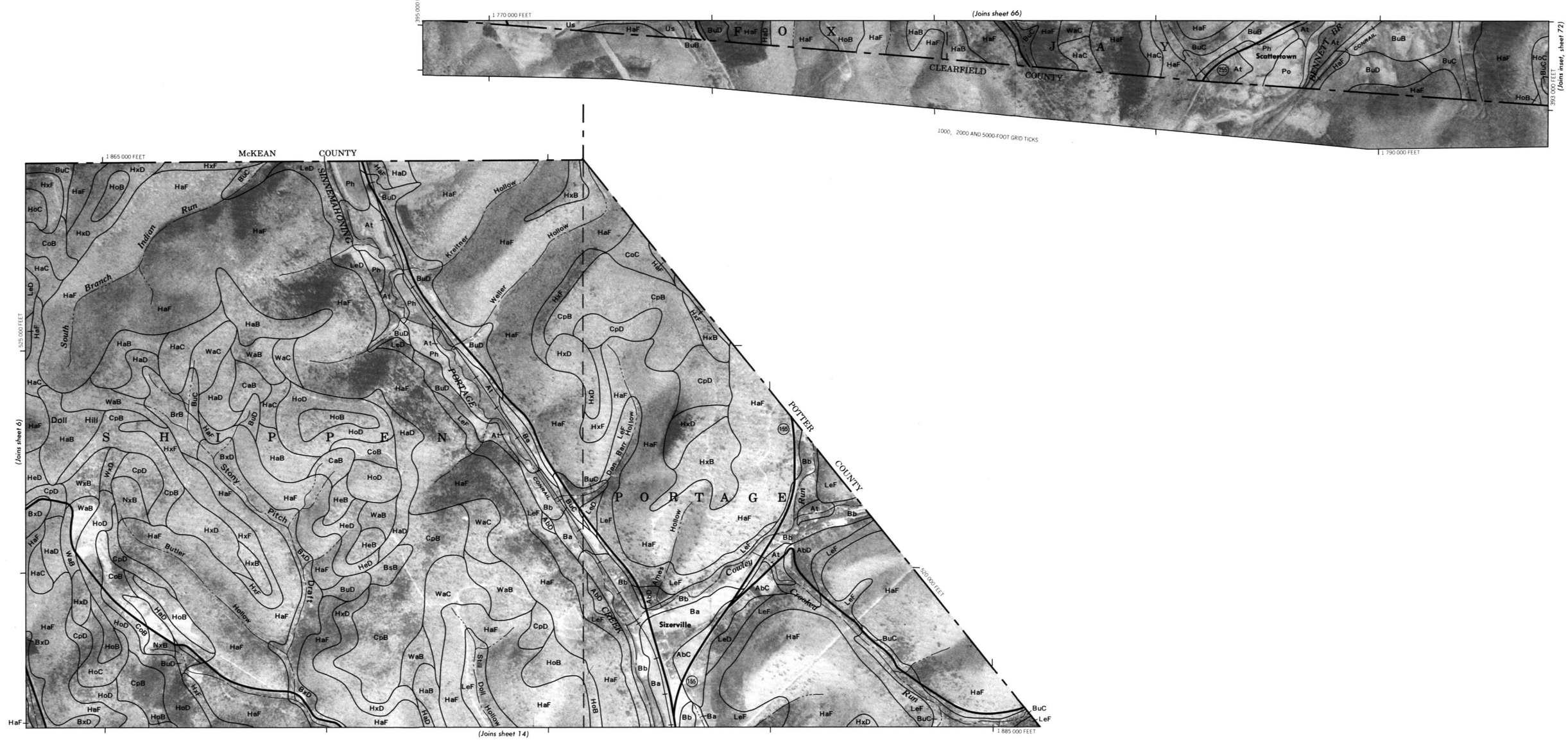



N
(Joins inset, sheet 73)
1 790 000 FEET
(Joins sheet 3)
530 000 FEET
(Joins sheet 5)
520 000 FEET
(Joins sheet 11)
1 765 000 FEET
FIVEMILE RUN
EAST BRANCH CLARION RIVER
EAST BRANCH LAKE
JONES
Midmont
BALTIMORE AND OHIO
Stuarts Run
Burgundy Run
Whittaker Run
Ospeck Run
Straight Run
Naval Run
Pest Hollow
Lakes Run
Hollow
Creek
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

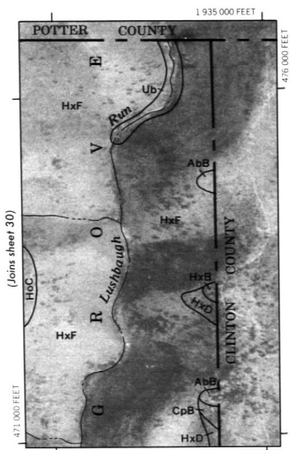

5
N
1 795 000 FEET
530 000 FEET
McKEAN COUNTY
(Joins inset, sheet 73)
535 000 FEET
533 000 FEET
J O N E S
(Joins upper left)
1 800 000 FEET
2000 AND 5000-FOOT GRID TICKS
(Joins sheet 4)
(Joins sheet 6)
(Joins sheet 12)
1 825 000 FEET
520 000 FEET
ELK COUNTY
CAMERON COUNTY
S H I P P E N
Straight Creek
Wellendorf
N Fk Straight Creek
Dead Mans Lick
Billy Buck Run
Elk Fork
Oswalt Branch
Brewer Fork
Nichols Run
1 MILE
1 KILOMETER
SCALE 1:20 000


N
1 860 000 FEET
530 000 FEET
500 000 FEET
1 830 000 FEET
McKEAN COUNTY
(Joins sheet 5)
(Joins sheet 7)
(Joins sheet 13)
HIGHLAND TOWNSHIP
Hunters Run
Six And One Half Hollow
Twenty Hollow
Old Wall Hollow
North Fork
Sixmile Hollow
Fivemile Run
Waldy Run
Left Branch
Right Branch
Ford Hollow
Pepper Creek
Fourmile Run
Roaring Run
Left Branch
Fourmile Run
1 MILE
1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF CAMERON AND ELK COUNTIES, PENNSYLVANIA — SHEET NUMBER 7



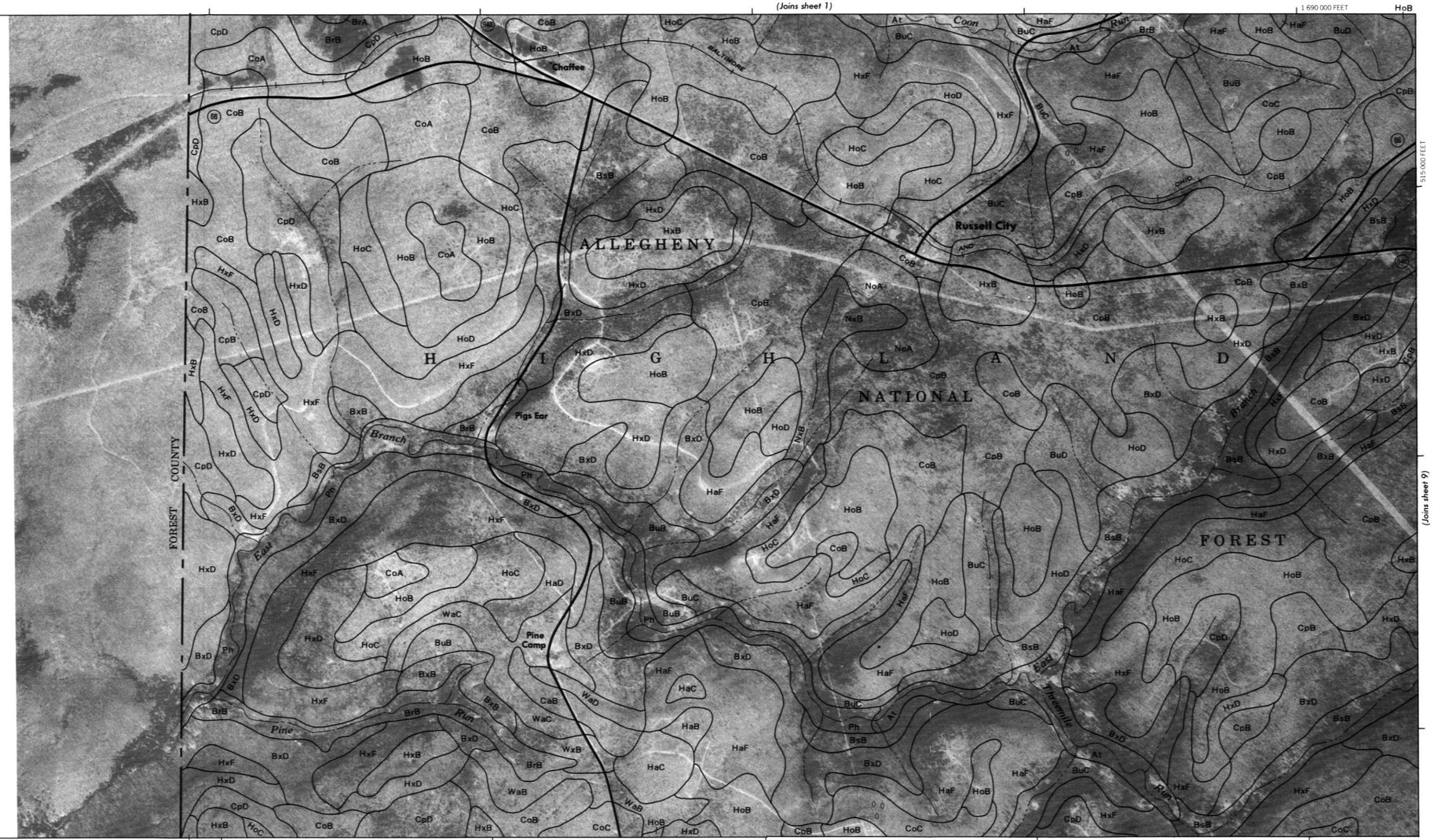
N



(Joins sheet 30)

(Joins inset, sheet 15)

3000 AND 5000-FOOT GRID TICKS



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

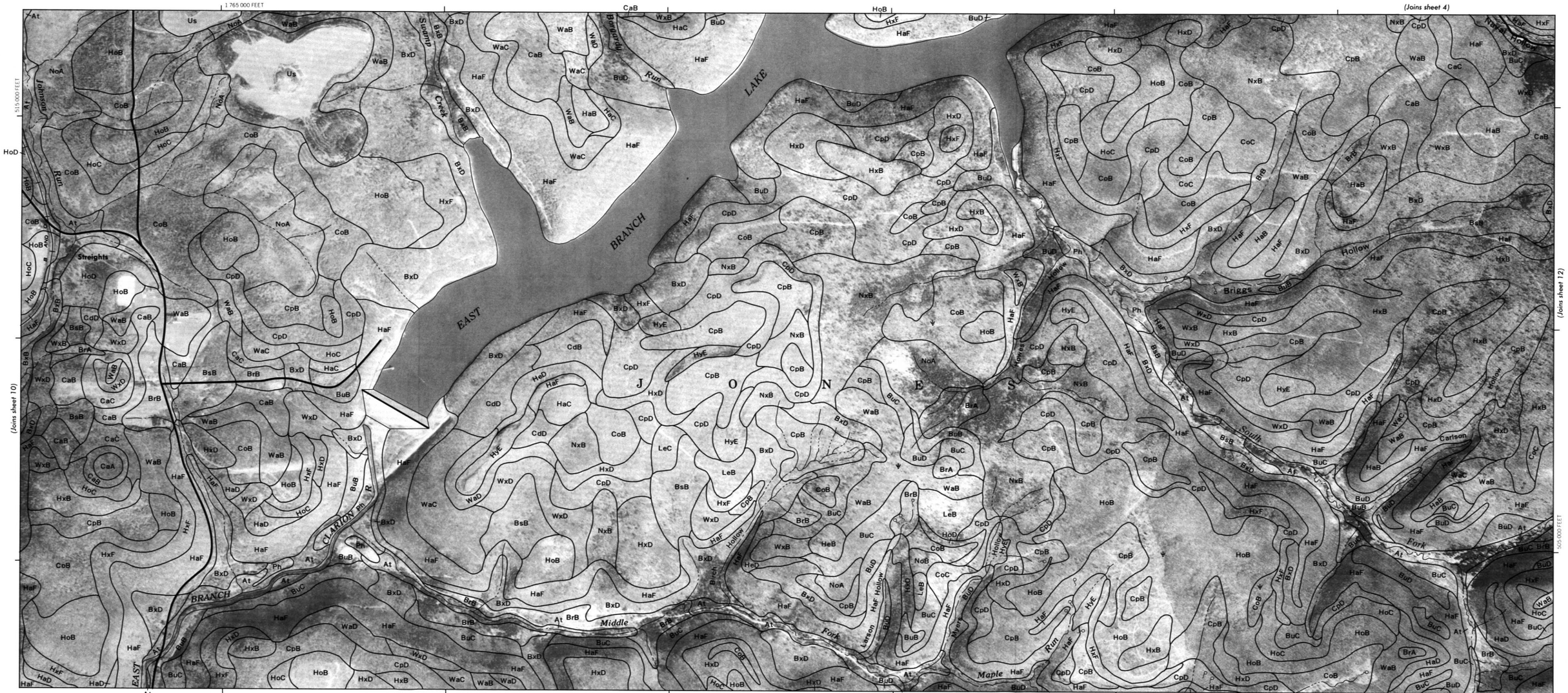

1 695 000 FEET
515 000 FEET
(Joins sheet 2)
(Joins sheet 8)
(Joins sheet 10)
(Joins sheet 16)
505 000 FEET
1 725 000 FEET
ALLEGHENY
NATIONAL
HIGHLAND
JOHNSONS
FOREST
Highland Corners
Carlson
Nonsen
Ellithorpe
East Branch
Spring Creek
Run
Brush Hollow
Mill Creek
Maple Run
Pigeon Run
Silver Creek
Little Mill Creek
Big Mill Creek
Cherry Run
Ohio
BAL TIMORE AND
1 MILE
1 KILOMETER
SCALE 1:20 000
N

SOIL SURVEY OF CAMERON AND ELK COUNTIES, PENNSYLVANIA — SHEET NUMBER 10

1 — 3/4 — 1/2 — 1/4 — 0 — 1 MILE

1 — 0.5 — 0 — 1 KILOMETER

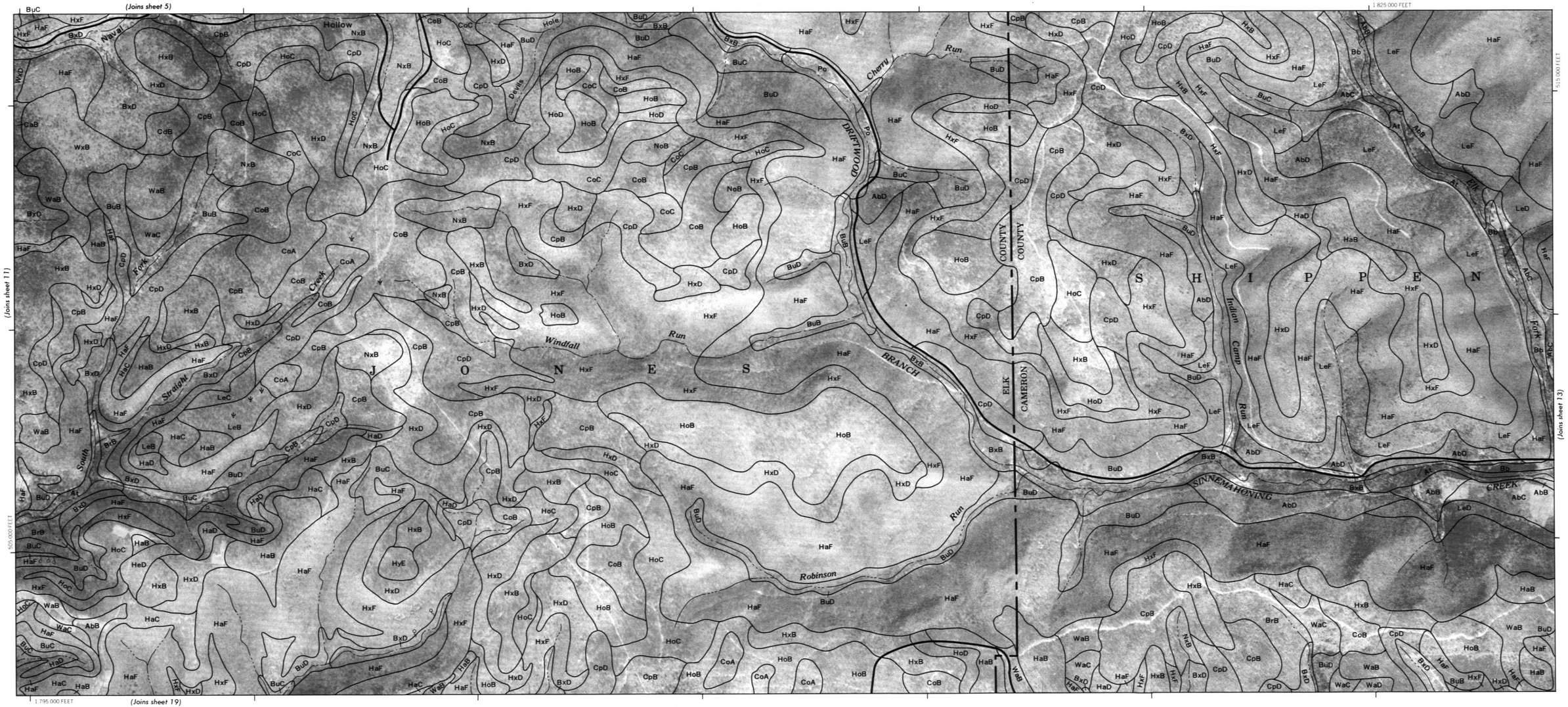
SCALE 1:20 000



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


N
(Joins sheet 5)
1 825 000 FEET
515 000 FEET
(Joins sheet 11)
(Joins sheet 13)
505 000 FEET
1 795 000 FEET
(Joins sheet 19)
JONES
SHIPPEN
ELK
CAMERON
COUNTY
COUNTY
Naval Hollow
Devils Hole
Cherry Run
DRIFTWOOD
Pe
Windfall Run
BRANCH
Straight
South Fork
Creek
Indian Camp Run
At Elk
Fork
SINNEMAHONING
CREEK
Robinson Run
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

13

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

SOIL SURVEY OF CAMERON AND ELK COUNTIES, PENNSYLVANIA — SHEET NUMBER 14

N

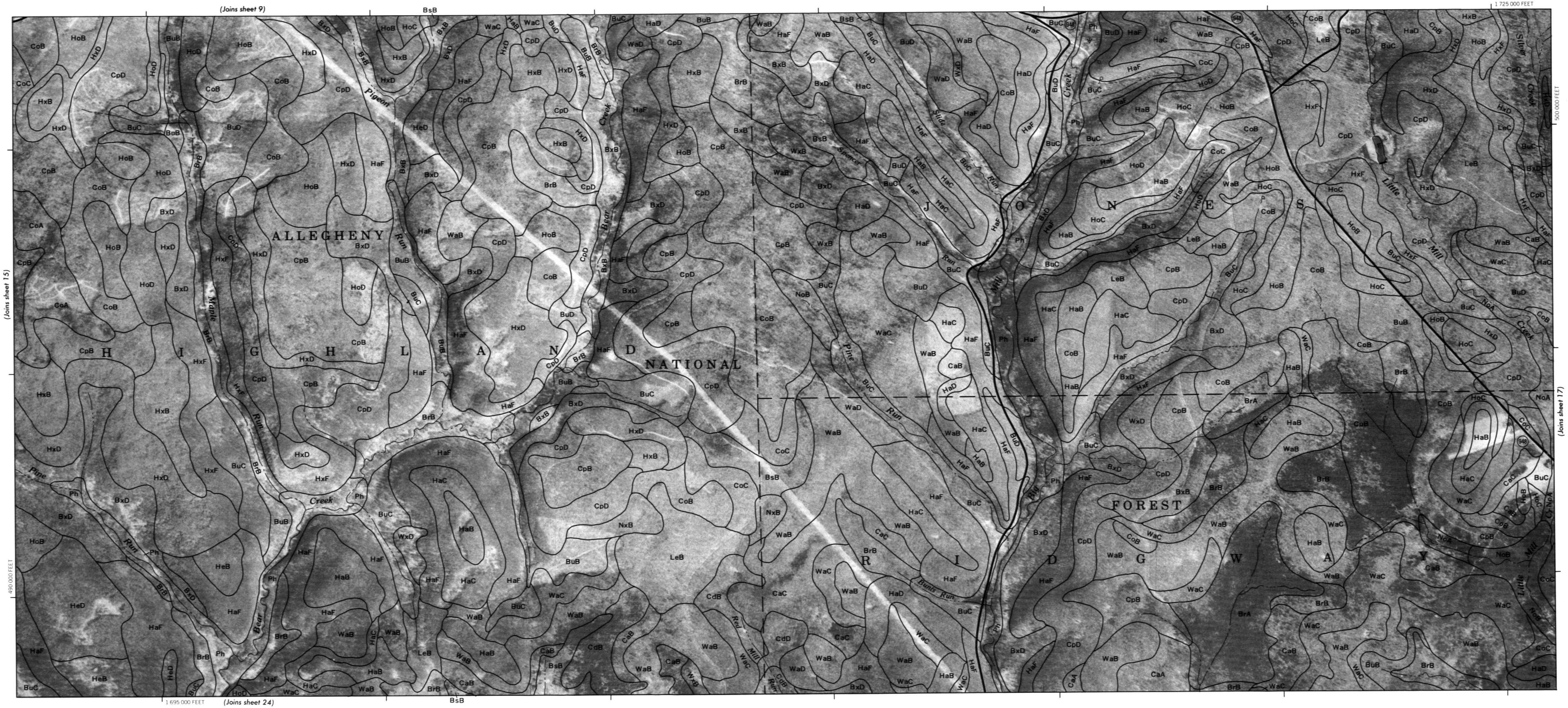
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


N
(Joins inset, sheet 8)
1 932 000 FEET
470 000 FEET
(Joins inset, sheet 39)
(Joins inset, sheet 23)
1 935 000 FEET
460 000 FEET
3000 AND 5000-FOOT GRID TICKS
1 670 000 FEET
(Joins sheet 8)
590 000 FEET
(Joins sheet 16)
490 000 FEET
(Joins sheet 23)
1 690 000 FEET
FOREST COUNTY
CLINTON COUNTY
ALLEGHENY
HIGH
NATIONAL
FOREST
Four Corners
Sackett
Wagner
Run
Creek
Hunter
Little
Twin
Pine
Lick
Tributary
1 MILE
1 KILOMETER
SCALE 1:20 000

N

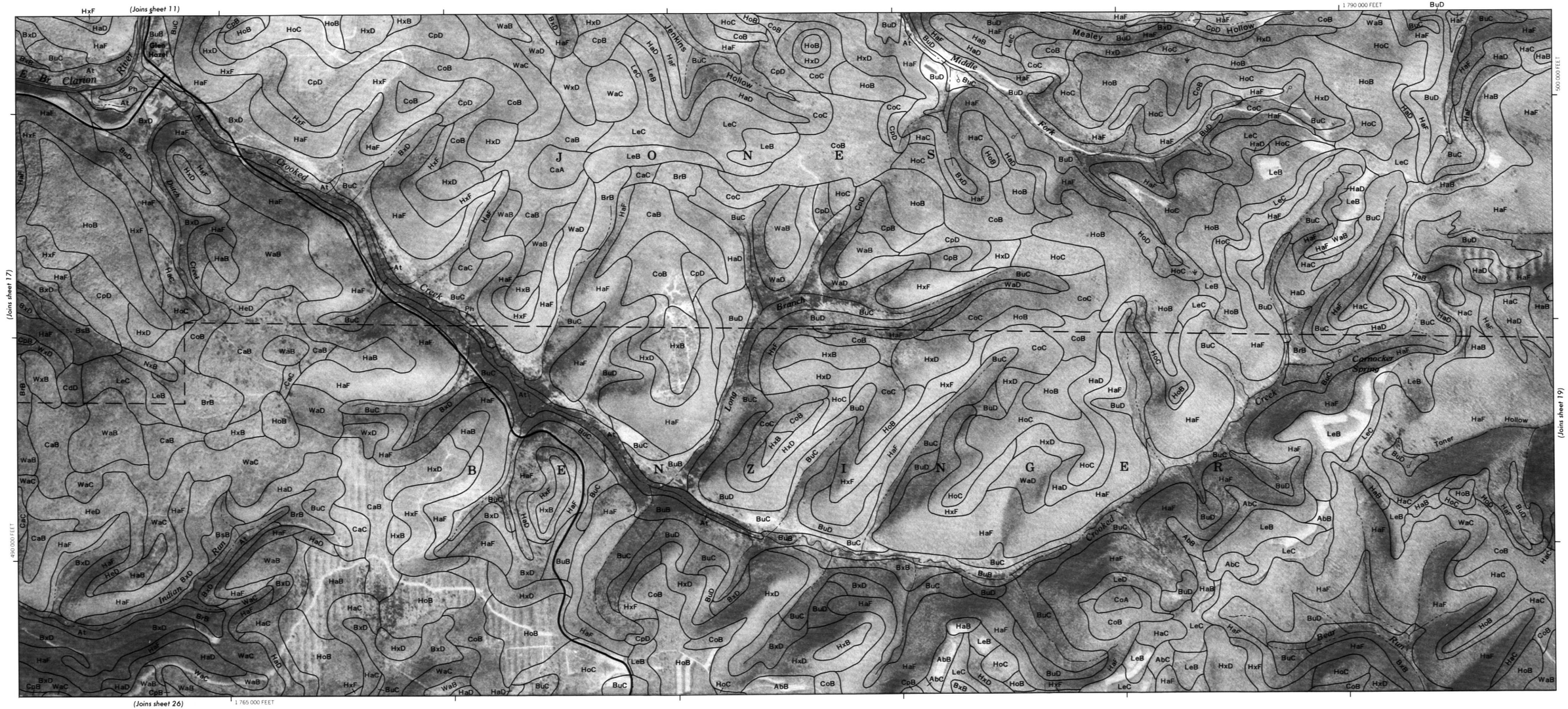


1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

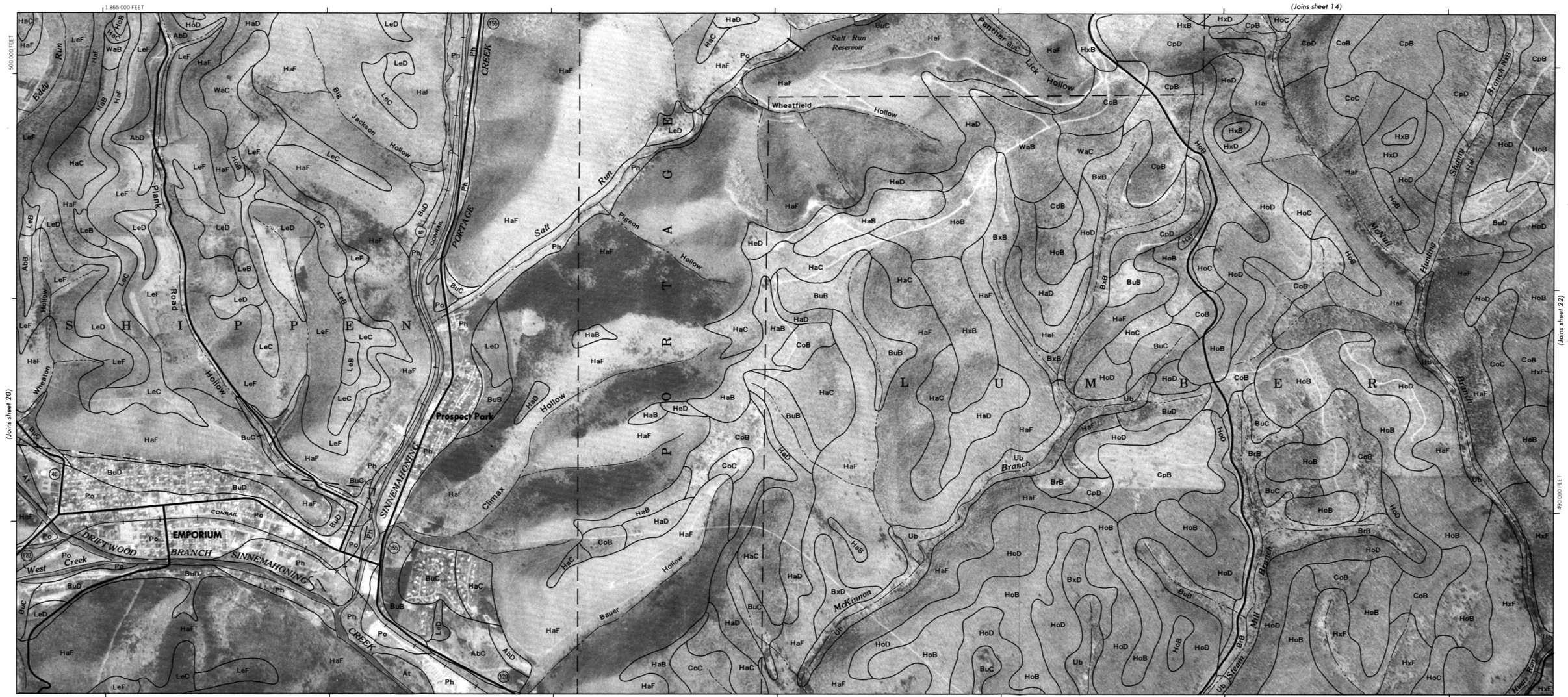
SCALE 1:20 000


17
N
1 730 000 FEET
500 000 FEET
(Joins sheet 10)
(Joins sheet 16)
(Joins sheet 18)
(Joins sheet 25)
490 000 FEET
1 760 000 FEET
ALLEGHENY
NATIONAL
FOREST
JONES
BRANCH
CLARION
RIVER
BENZINGER
RIDGE
Little Mill Creek
Silver Creek
Bear Creek
Little Wolf Run
Meffert Creek
Tamblne
Ketner
JOHNSONBURG
Indian Run
EAST
WEST
1 MILE
1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 11)
1 790 000 FEET
960 000 FEET
(Joins sheet 17)
(Joins sheet 19)
490 000 FEET
(Joins sheet 26)
1 765 000 FEET
E. Br. Clarion River
Crooked Creek
Jenkins Hollow
Middle Fork
Mealey Hollow
Long Branch
Camocker Spring Creek
Toner Hollow
Indian Run
Bear Run
JONES ZIONE
GENERAL
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

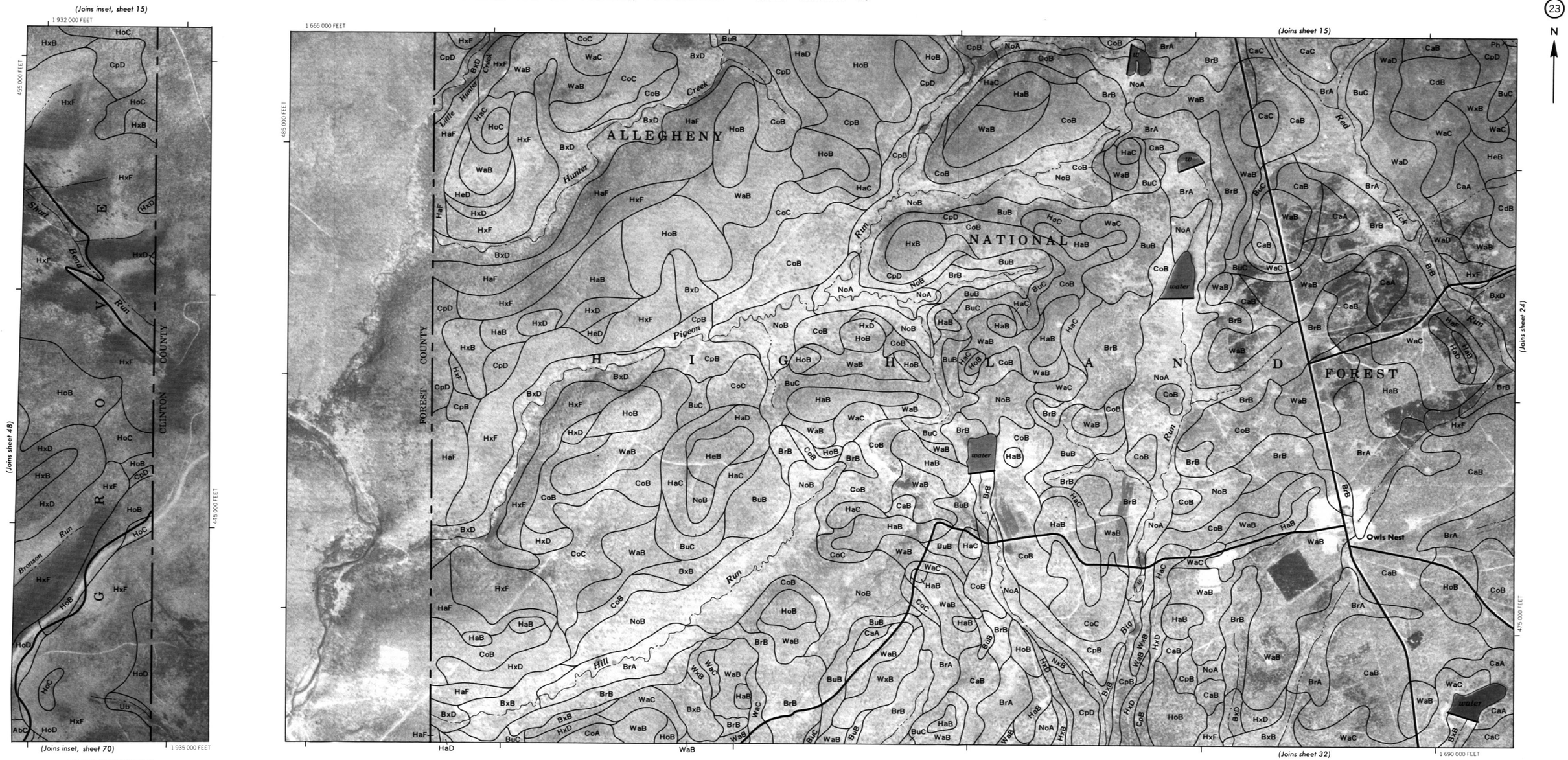

1 795 000 FEET
(Joins sheet 12)
500 000 FEET
(Joins sheet 18)
(Joins sheet 20)
490 000 FEET
(Joins sheet 27)
1 825 000 FEET
N
JONES
SHIPPEN
BENZINGER
ELK COUNTY
CAMERON COUNTY
North Fork Transfer Creek
Bull Wheel Hollow
West Creek
Toner Hollow
Company Hollow
H. C. Hollow
Ball Hollow
Whitman Hollow
Boy Scout Hollow
Right Hand Fork Clear Creek
Little Clear Creek
Seeley Hollow
Bingman Hollow
Lockwood Run
Bunny Hollow
Post Hollow
Mud Run
Wright Hollow
Mason Hollow
Clear Creek
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 13)
(Joins sheet 19)
(Joins sheet 21)
(Joins sheet 28)
1 860 000 FEET
500 000 FEET
490 000 FEET
1 830 000 FEET
Bobby Run
Rocky Run
Chop Run
Clear Creek
DRIFTWOOD BRANCH
SINNEMAHONING CREEK
WEST CREEK
North Creek
Lewis Run
Cooks Run
Johns Run
Britton Run
Dodge Hollow
Eddy Run
Ferguson Hollow
Swesey Hollow
Towner Run
Boardinghouse Hollow
Thayer Run
Day Run
Jenks Run
S H I P P E N
Lockwood
Weber City
Emporium Reservoir
CONRAIL
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


1 865 000 FEET
500 000 FEET
(Joins sheet 14)
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 29)
1 895 000 FEET
490 000 FEET
N
SHIPPEN
PORTAGE
LUMBER
Bdy Run
Plank Road
Hollow
Whaston
Big Jackson Hollow
Salt Run
Pigeon Hollow
Wheatfield Hollow
Salt Run Reservoir
Panther Buc
Lick Hollow
Prospect Park
Climax
SINNEMAHONING CREEK
CONRAIL
EMPORIUM
DRIFTWOOD BRANCH SINNEMAHONING
West Creek
Bauer Hollow
McKinnon
Ub Branch
Mill Branch
Steam
Shanty Branch
McNutt Hunting
Brandt
Hicks Run
1 MILE
1 KILOMETER
SCALE 1:20 000

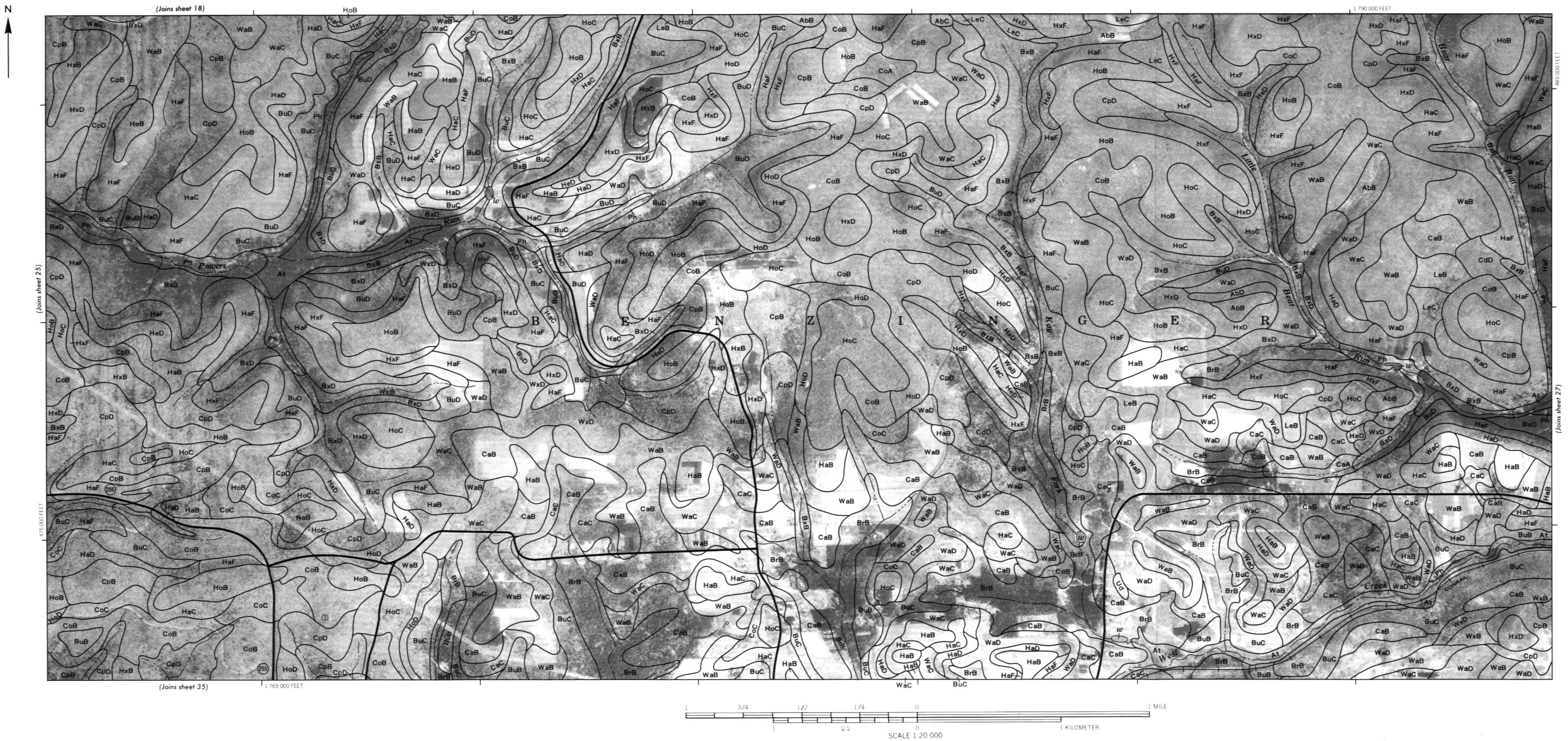

N
(Joins sheet 21) (Joins 14)
1 910 000 FEET
500 000 FEET
490 000 FEET
1 900 000 FEET
(Joins sheet 30)
POTTER COUNTY
L U M B E R
G R O V E
Hunts Run
Shanty Branch
Colbert
Hollow
Deloy
Draft
Moore
(Joins sheet 70)
(Joins sheet 73)
385 000 FEET
390 000 FEET
G I B S O N
Upper Jerry Run
Jerry Lick
Smoke
CLINTON COUNTY
CLEARFIELD COUNTY
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000

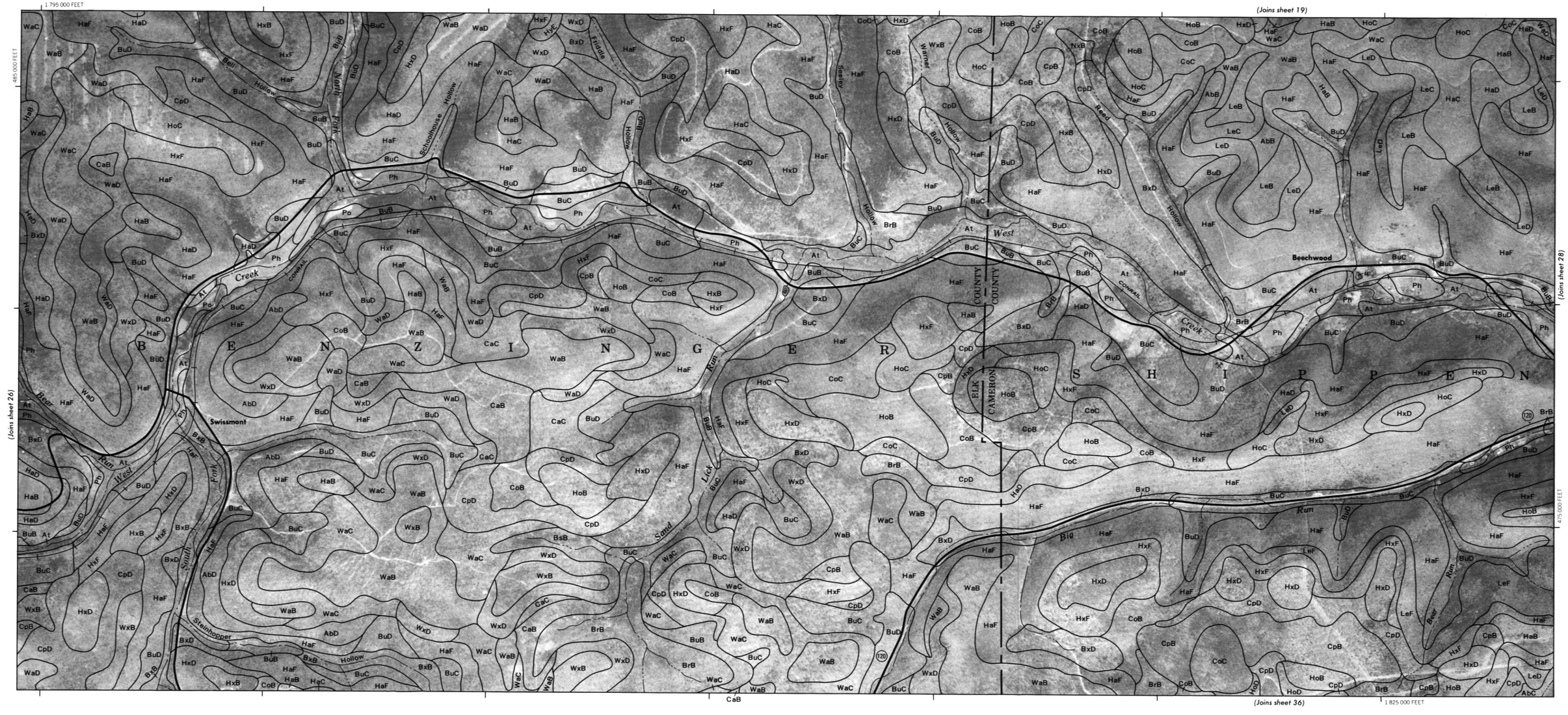
N


(Joins inset, sheet 15)
1 932 000 FEET
455 000 FEET
(Joins inset, sheet 48)
(Joins inset, sheet 70)
1 935 000 FEET
445 000 FEET
3000 AND 5000-FOOT GRID TICKS
1 665 000 FEET
485 000 FEET
(Joins sheet 15)
(Joins sheet 24)
(Joins sheet 32)
1 690 000 FEET
475 000 FEET
CLINTON COUNTY
FOREST COUNTY
ALLEGHENY
NATIONAL
FOREST
Owls Nest
Short Bend Run
Bronson Run
Little Hunter Creek
Hunter Run
Pigeon Run
Big Hill Run
Red Lick Run
water
1 MILE
1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 16)
1 725 000 FEET
485 000 FEET
(Joins sheet 23)
(Joins sheet 25)
475 000 FEET
1 695 000 FEET
(Joins sheet 33)
ALLEGHENY
HIGHLAND
NATIONAL
RIDGE
GWAY
FOREST
Twin
Lick
Run
Red
Bear
Bloody
Creek
Mill
Rocky
Mason
BOUNDARY
NATIONAL
FOREST
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
0,5
SCALE 1:20 000

SOIL SURVEY OF CAMERON AND ELK COUNTIES, PENNSYLVANIA — SHEET NUMBER 25


N
(Joins sheet 18)
(Joins sheet 25)
(Joins sheet 27)
(Joins sheet 35)
1 790 000 FEET
485 000 FEET
475 000 FEET
1 765 000 FEET
B E N Z I N G E R
Powers Run
Little Bear Run
Bear Run
Kersey Run
Fork
West Creek
CONRAIL
255
1 MILE
1 KILOMETER
SCALE 1:20 000


1 795 000 FEET
(Joins sheet 19)
485 000 FEET
(Joins sheet 26)
(Joins sheet 28)
475 000 FEET
(Joins sheet 36)
1 825 000 FEET
BENZINGER
ELK COUNTY
CAMERON COUNTY
SHIPPEN
Swissmont
Beechwood
Bell Hollow
North Fork
Schoolhouse Hollow
Friddle Hollow
Seeley Hollow
Warner Hollow
Reed Hollow
Creek
Run
West Fork
Sand Lick Run
Big Run
Steinhopper Hollow
Bear Run
CONRAIL
120
1 MILE
1 KILOMETER
SCALE 1:20 000

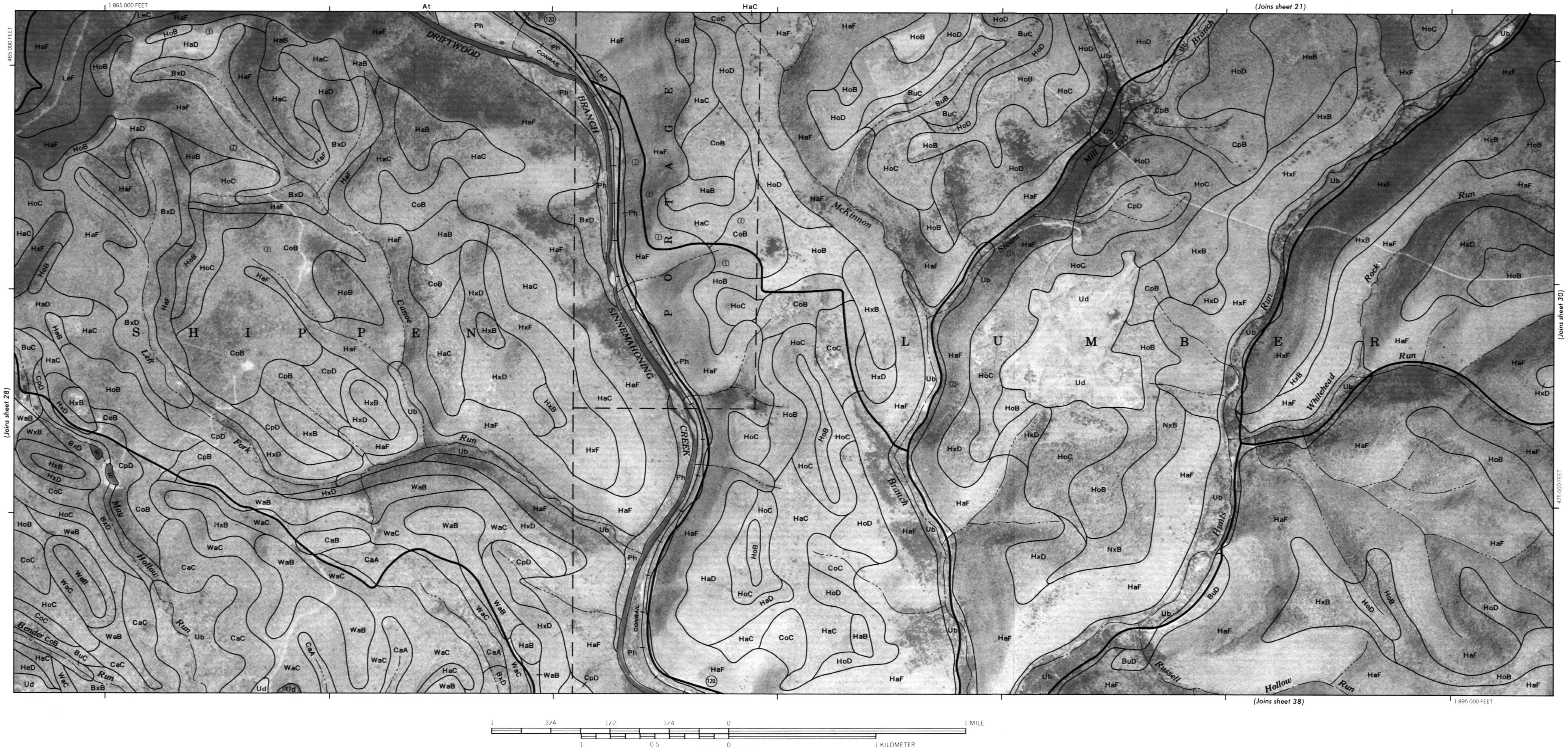
N

1 MILE — 1 3/4 1/2 1/4 0

1 KILOMETER — 1 0.5 0

SCALE 1:20 000

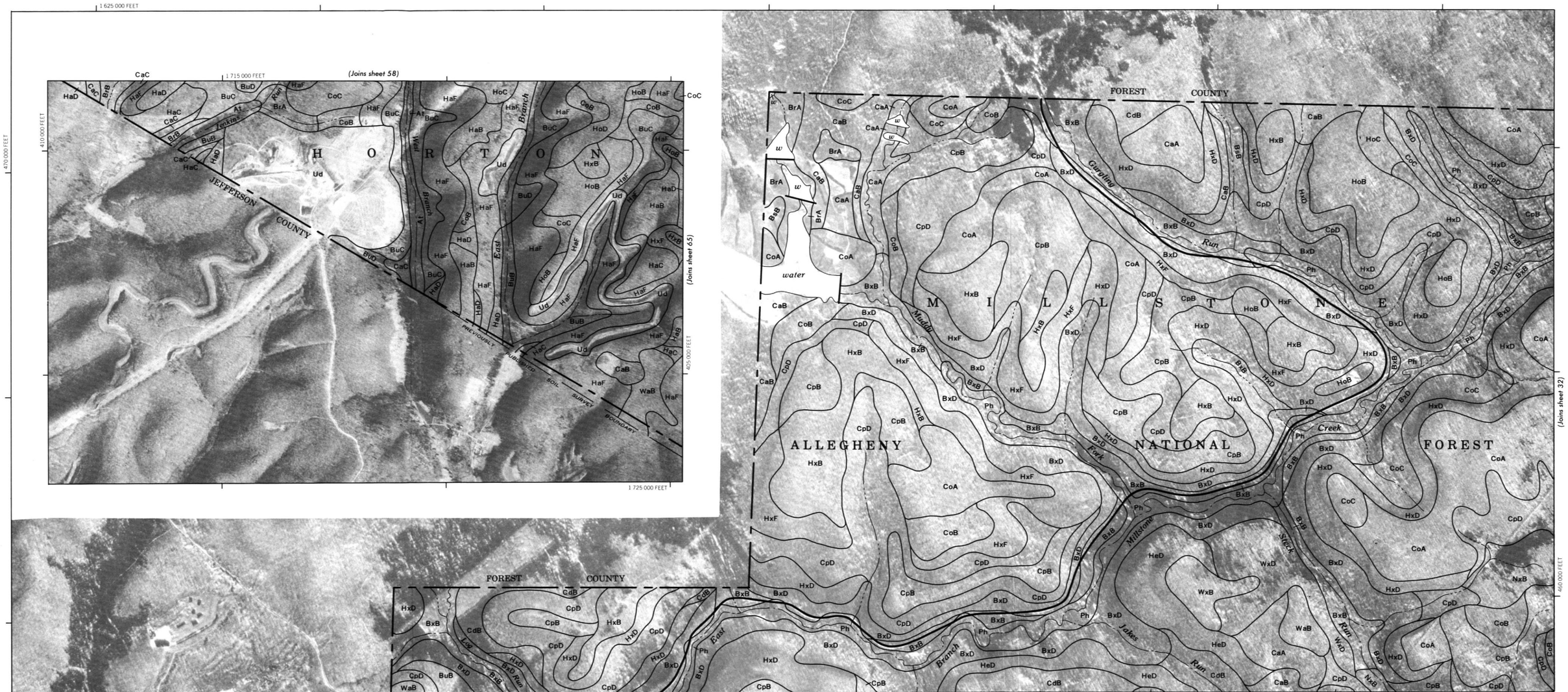
N

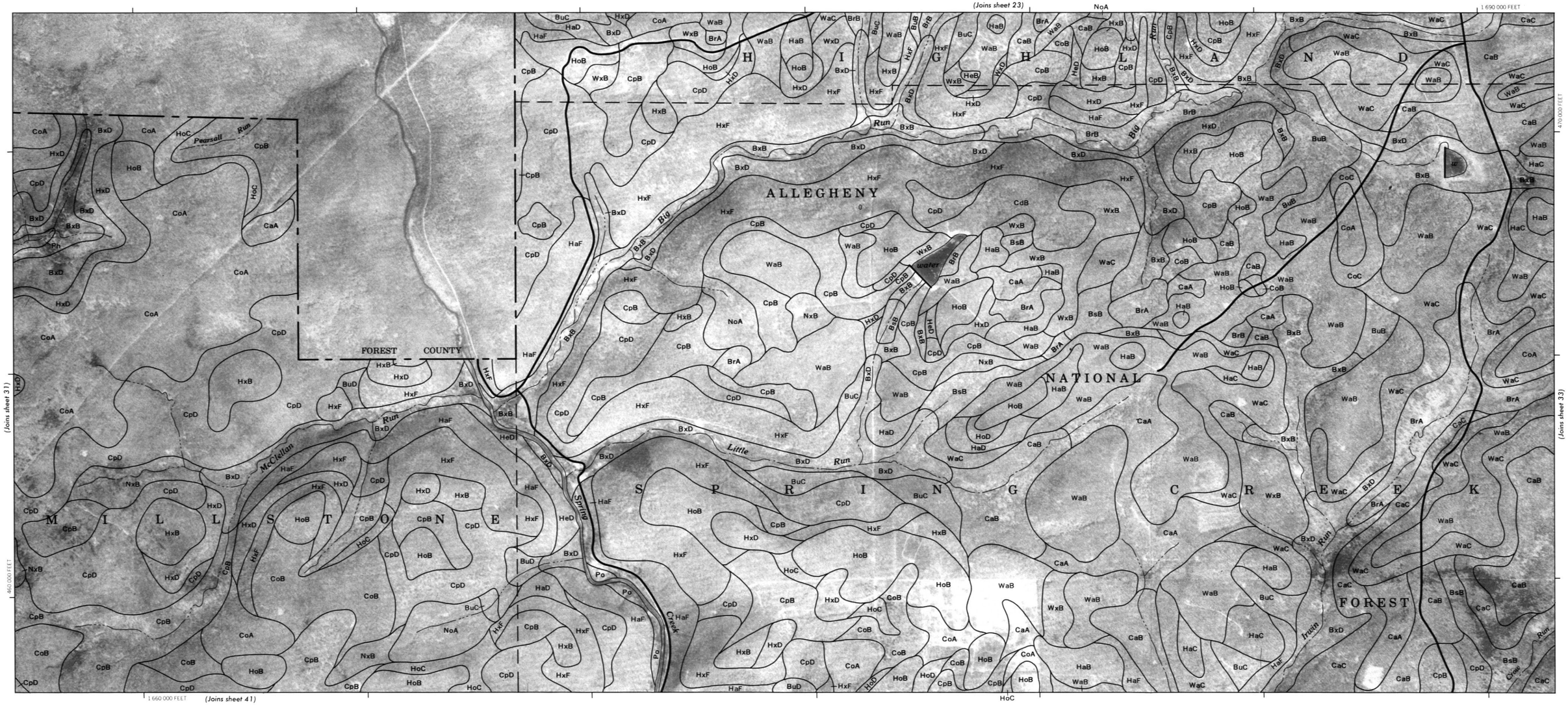


SCALE 1:20 000

N


(Joins sheet 22)
1 930 000 FEET
485 000 FEET
(Joins sheet 29)
475 000 FEET
(Joins inset, sheet 8)
1 900 000 FEET
(Joins sheet 39)
Moore
Draft
Rock Run
Whitehead
Run
Logue
Run
Upper Logue
Hollow
POTTER
COUNTY
CREEK
FORK SINNEMAHONING
Run
Owl
Rattlesnake
Hollow
Run
Mullen
LUMBER
GROVE
AbD
AbB
HoC
HxF
CoC
HoD
HoB
HaF
HaC
HaD
LeC
LeB
BuC
BrB
CpD
LeD
LeF
HxD
HxB
AbB
HaB
CoB
BuD
Ba
At
AbC
HoE
HxF
HoB
HoC
HoD
HaF
HaB
HaC
HaD
HxD
HxB
BuC
BuD
LeB
LeC
LeD
LeF
1 MILE
1 3/4
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000


1 625 000 FEET
1 715 000 FEET
1 725 000 FEET
1 655 000 FEET
470 000 FEET
410 000 FEET
405 000 FEET
460 000 FEET
N
(Joins sheet 58)
(Joins sheet 65)
(Joins sheet 32)
(Joins sheet 40)
JEFFERSON COUNTY
FOREST COUNTY
HORTON
MILLSTONE
ALLEGHENY NATIONAL FOREST
PREVIOUSLY PUBLISHED SOIL SURVEY BOUNDARY
water
Jenkins Run
West Branch
East Branch
Medix Run
Gurgling Run
Fork
Millstone Creek
Stack Run
Jakes Run
Log Run
1 MILE
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000


N
(Joins sheet 23)
1 690 000 FEET
470 000 FEET
460 000 FEET
1 660 000 FEET
(Joins sheet 31)
(Joins sheet 33)
(Joins sheet 41)
ALLEGHENY
NATIONAL
FOREST
COUNTY
FOREST
SPRING CREEK
MILLSTONE
HIGHLANDS
Pearsall Run
Big Run
Little Run
McClellan Run
Spring Creek
Po Creek
Irwin Run
water
1 MILE
1 KILOMETER
SCALE 1:20 000

1 MILE
1 KILOMETER
SCALE 1:20 000

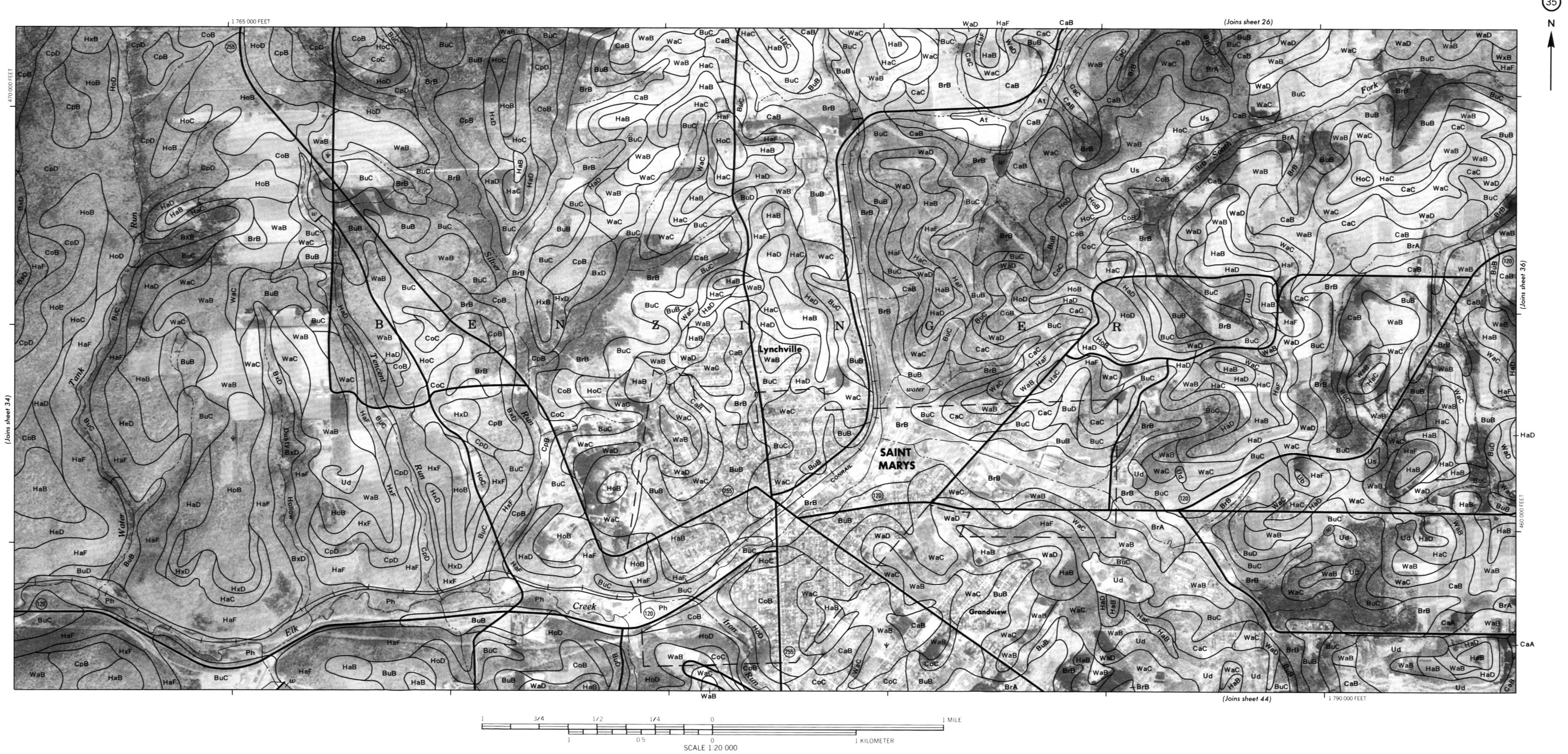
34

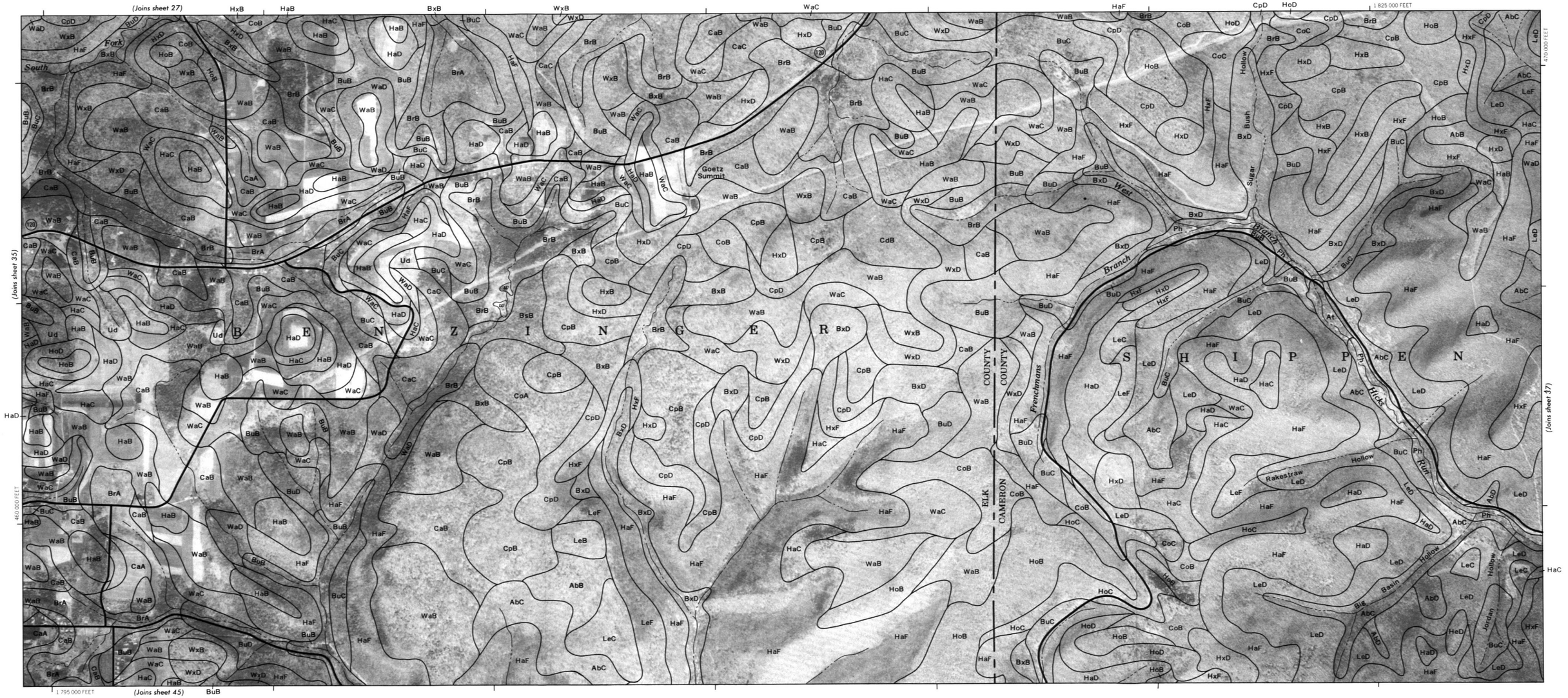
N

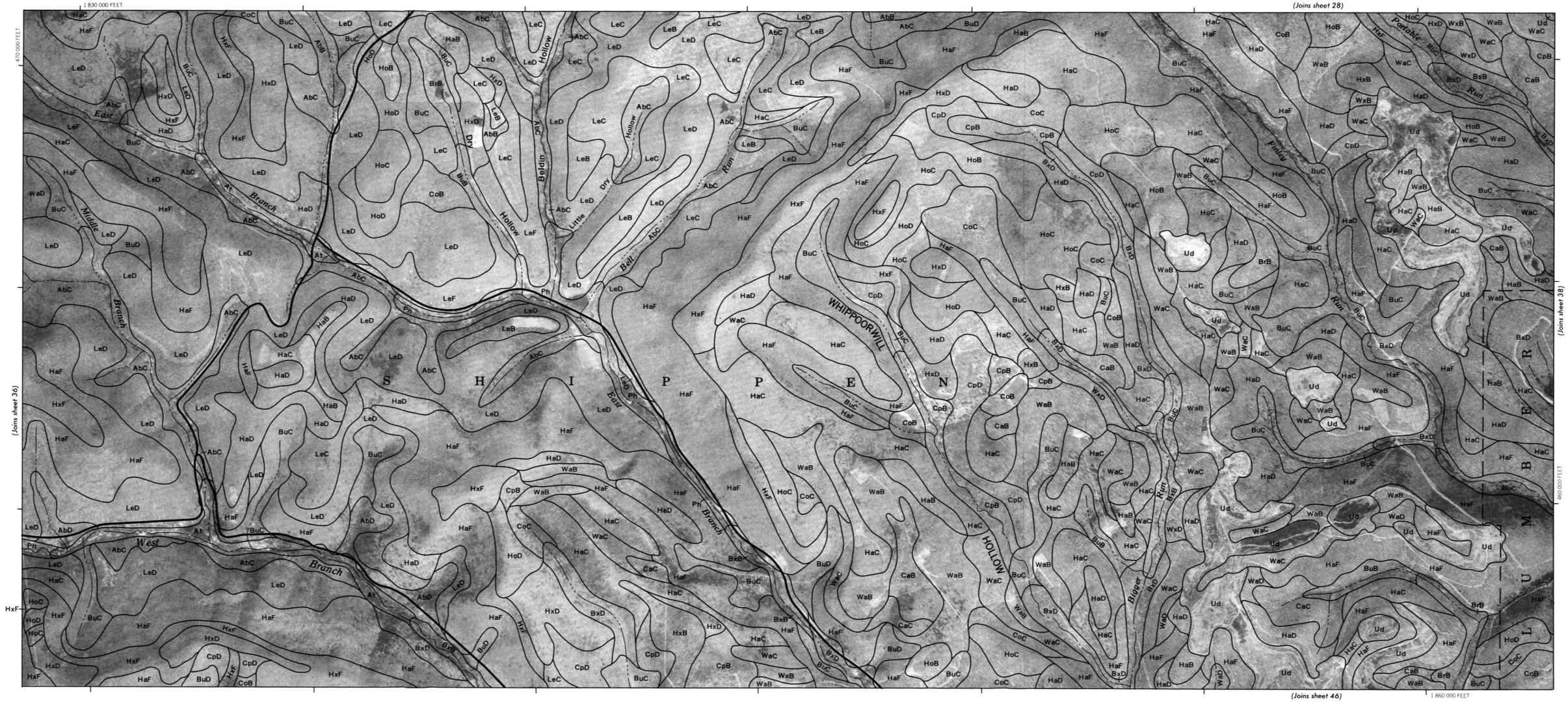
1 MILE — 1 — 3/4 — 1/2 — 1/4 — 0

1 KILOMETER — 1 — 0.5 — 0

SCALE 1:20 000


35
N
1 765 000 FEET
470 000 FEET
(Joins sheet 26)
(Joins sheet 34)
(Joins sheet 36)
(Joins sheet 44)
460 000 FEET
1 790 000 FEET
B E N Z I N G E R
Lynchville
SAINT MARYS
Grandview
CONRAIL
Elk
Creek
Iron Run
Silver Creek
Tencent Run
Tank Water Run
Dusty Hollow
South Fork
water
1 MILE
1 KILOMETER
SCALE 1:20 000

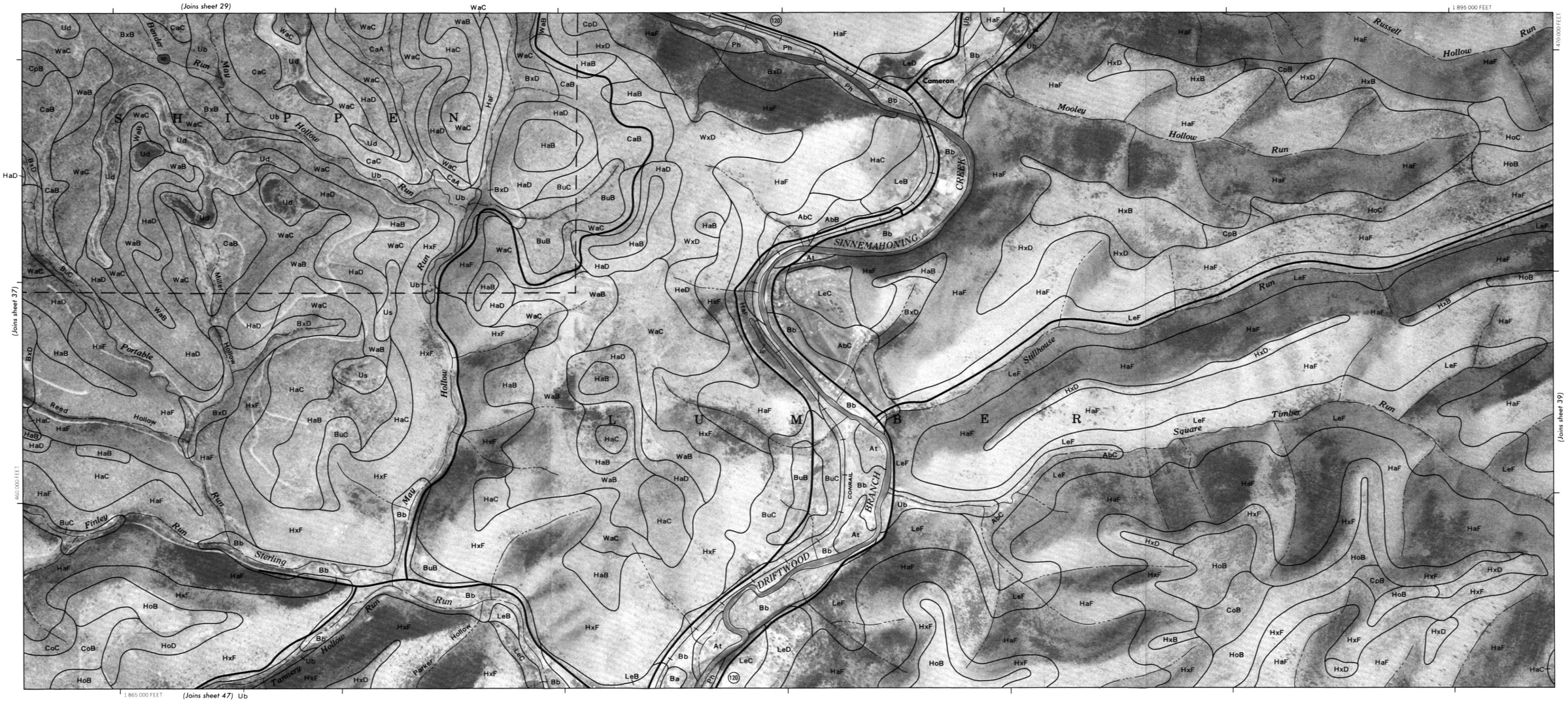

N
(Joins sheet 27)
(Joins sheet 35)
(Joins sheet 37)
(Joins sheet 45)
1 825 000 FEET
1 795 000 FEET
470 000 FEET
460 000 FEET
BENZINGER
ELK COUNTY
CAMERON COUNTY
SHIPPEN
Goetz Summit
Frenchmans
Bush
Sugar
West Branch Big Run
Hicks Run
Rakestraw Hollow
Big Basin Hollow
Jordan Hollow
Ph
At
Ud
MILE
KILOMETER
SCALE 1 20 000



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


N
(Joins sheet 29)
WaC
1 895 000 FEET
470 000 FEET
(Joins sheet 37)
(Joins sheet 39)
460 000 FEET
1 865 000 FEET
(Joins sheet 47) Ub
SHIPPEN
LUMBER
Border Run
Maul Run
Hollow
Miller Run
Portable Hollow
Reed Hollow
Finley Run
Sterling Run
Tannery Hollow
Parker Hollow
Maul Run
Hollow
Run
SINNEMAHONING CREEK
CONNAL BRANCH
DRIFTWOOD
Cameron
Mooley Hollow Run
Russell Hollow Run
Stillhouse Run
Timber Square Run
1 MILE
1/4
1/2
3/4
0
1 KILOMETER
0.5
SCALE 1:20 000

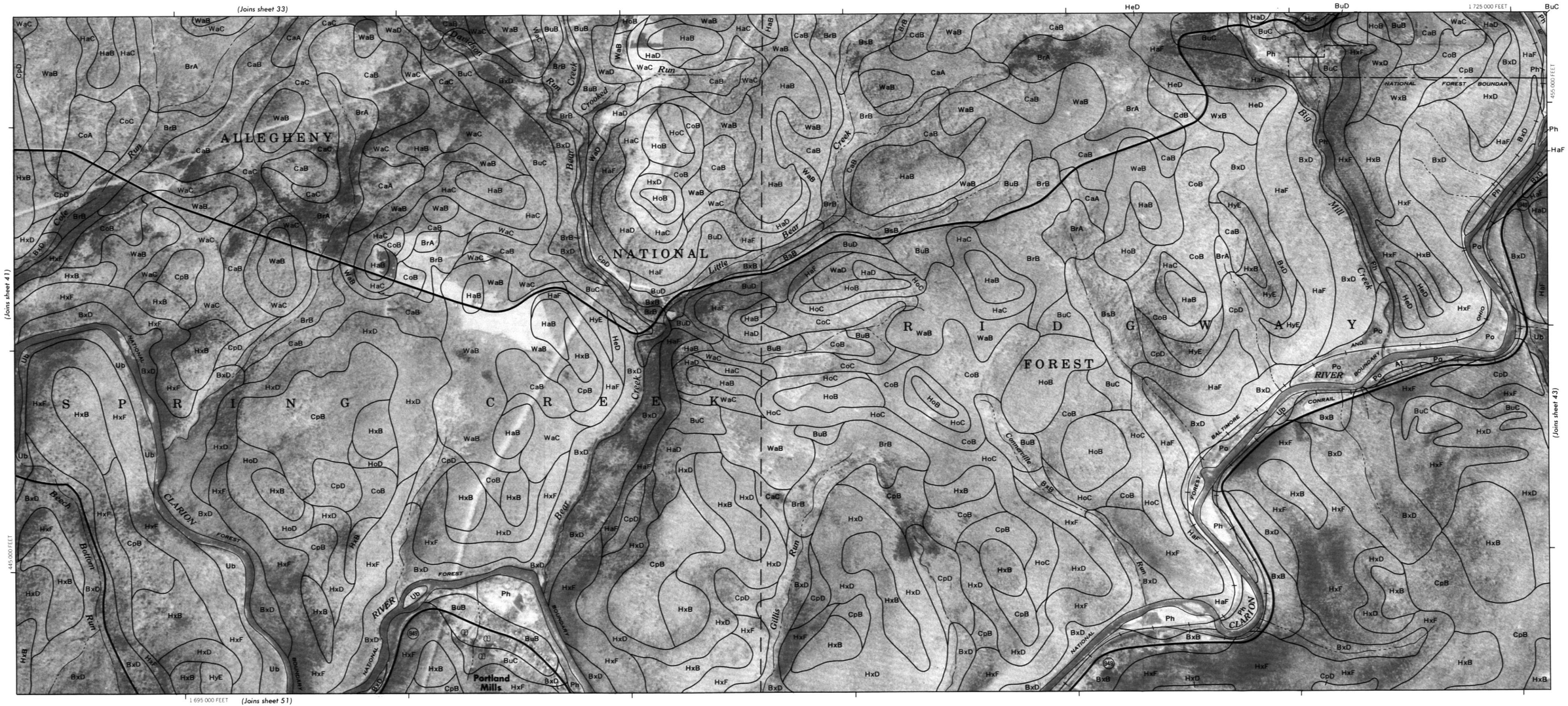
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

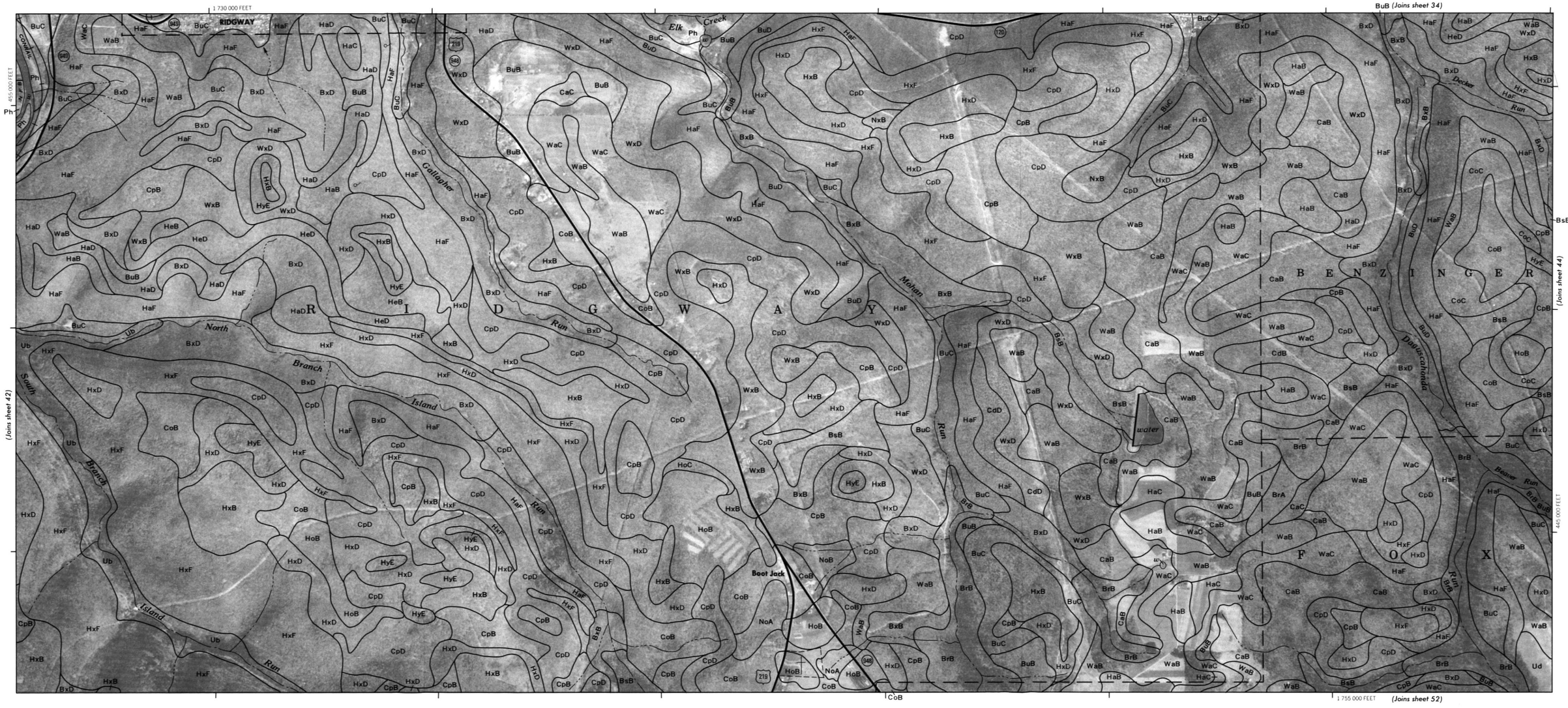
1 MILE 3/4 1/2 1/4 0 1 MILE

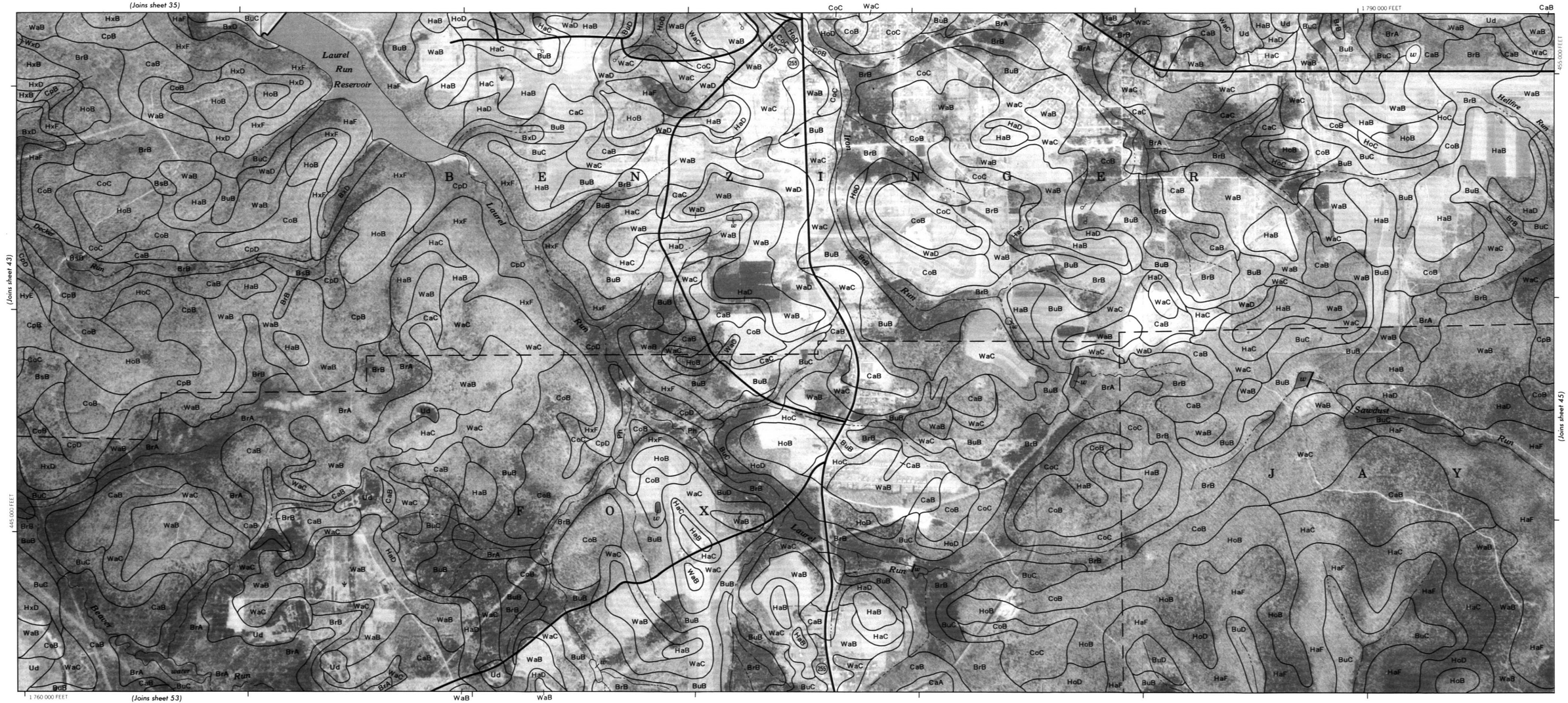
1 0.5 0 1 KILOMETER

SCALE 1:20 000


41
N
1 660 000 FEET
455 000 FEET
(Joins sheet 32)
(Joins sheet 40)
(Joins sheet 42)
(Joins sheet 50)
445 000 FEET
1 690 000 FEET
ALLEGHENY
NATIONAL
FOREST
MILLSTONE
SPRING
CREEK
Belvidere
Run
Lappin
Little
Crow
Spring Creek
Hallton
Irwin
Crow
Cole
Run
Church
Run
Elliott
Run
Painter
Run
Clarion
River
Arroyo
Maxwell
Run
Clyde
Run
Little
City
National Forest Boundary
Jefferson Co
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 33)
(Joins sheet 41)
(Joins sheet 43)
(Joins sheet 51)
1 725 000 FEET
1 695 000 FEET
455 000 FEET
445 000 FEET
ALLEGHENY NATIONAL FOREST
SPRING CREEK
RIDGWAY
CLARION RIVER
Portland Mills
Ridgway
Crooked Run
Bear Run
Little Bear Run
Mill Creek
Big Run
Gillis Run
Beech Bottom Run
Clarion River
Conrail
Baltimore & Ohio
Allegheny National Forest Boundary
Clarion River Forest Boundary
1 MILE
1 KILOMETER
SCALE 1:20 000

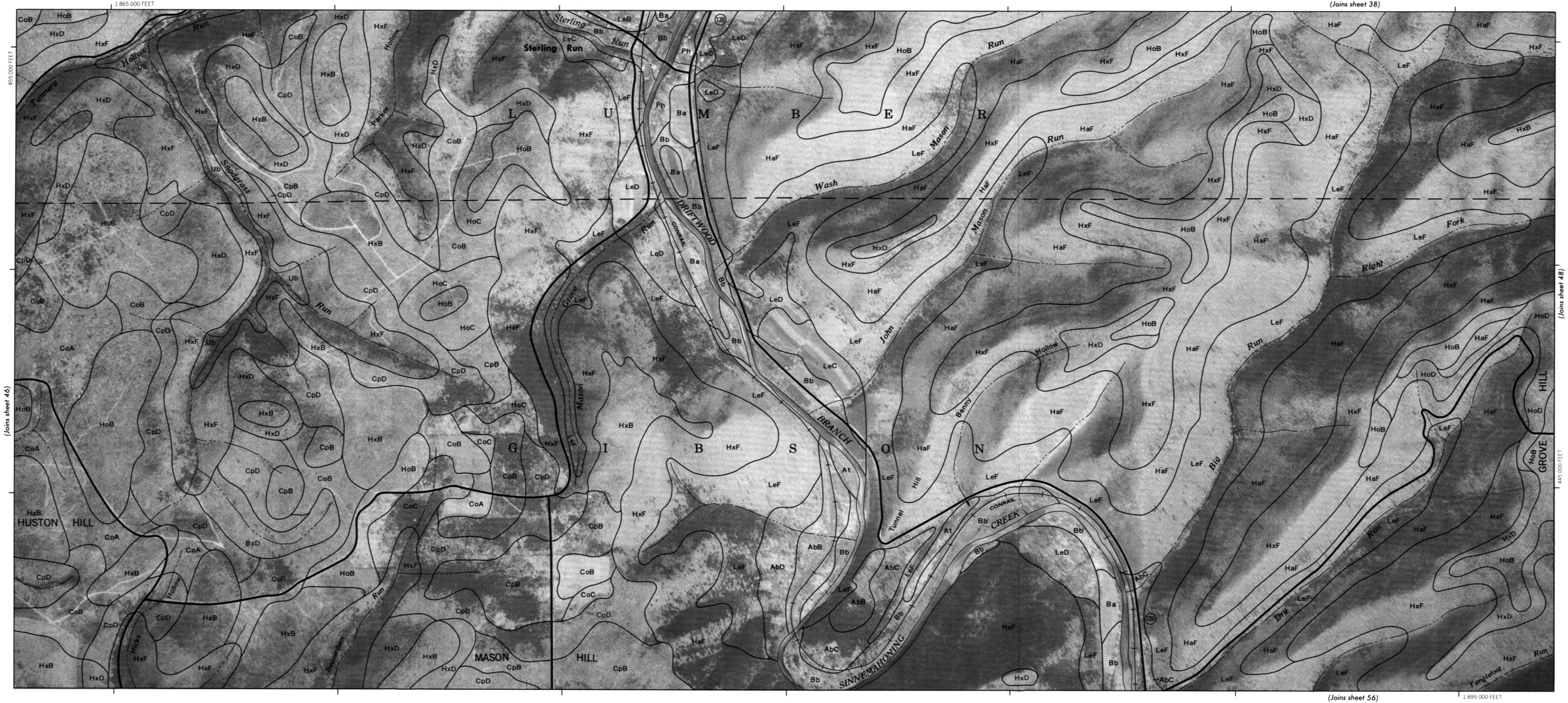

1 730 000 FEET
BuB (Joins sheet 34)
455 000 FEET
RIDGWAY
Elk Creek
Callagher
Mohan
North Branch
South Branch
Island Run
Boot Jack
Dauntscohonda
Decker Run
Beaver Run
water
RIDGWAY TOWNSHIP
BENZINGER TOWNSHIP
FOX
(Joins sheet 42)
(Joins sheet 44)
(Joins sheet 52)
1 755 000 FEET
N
1 MILE
1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 35)
1 790 000 FEET
(Joins sheet 43)
(Joins sheet 45)
445 000 FEET
455 000 FEET
1 760 000 FEET
(Joins sheet 53)
Laurel Run Reservoir
Laurel Run
Decker Run
Beech Run
Hellfire Run
Sawdust Run
BENZINGER JAY
BENZINGER FOX
water
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


1 795 000 FEET
1 825 000 FEET
455 000 FEET
445 000 FEET
N
(Joins sheet 36)
(Joins sheet 44)
(Joins sheet 46)
(Joins sheet 54)
CAMERON COUNTY
ELK COUNTY
BENZINGER
SHIPPEN
JAY
BENEZETTE
Liquor Run
Hellfire Run
Sawdust Run
Trout Run
Rock Lick Run
Hoover Hollow Run
Little Devils Run
Devils Run
1 MILE
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000


N
(Joins sheet 37)
1 860 000 FEET
455 000 FEET
(Joins sheet 45)
(Joins sheet 47)
445 000 FEET
1 830 000 FEET
(Joins sheet 55)
CAMERON CO
ELK COUNTY
SHIPPEN
BENEZETTE
BENEZETTE
CAMERON COUNTY
ELK COUNTY
West Branch Bell Hollow Draft Dark Hollow Shaffer Run McDonald Run Bigger Branch Huston Hill Barr Run Spring Run Sand Branch Little Run Tannery Hollow
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

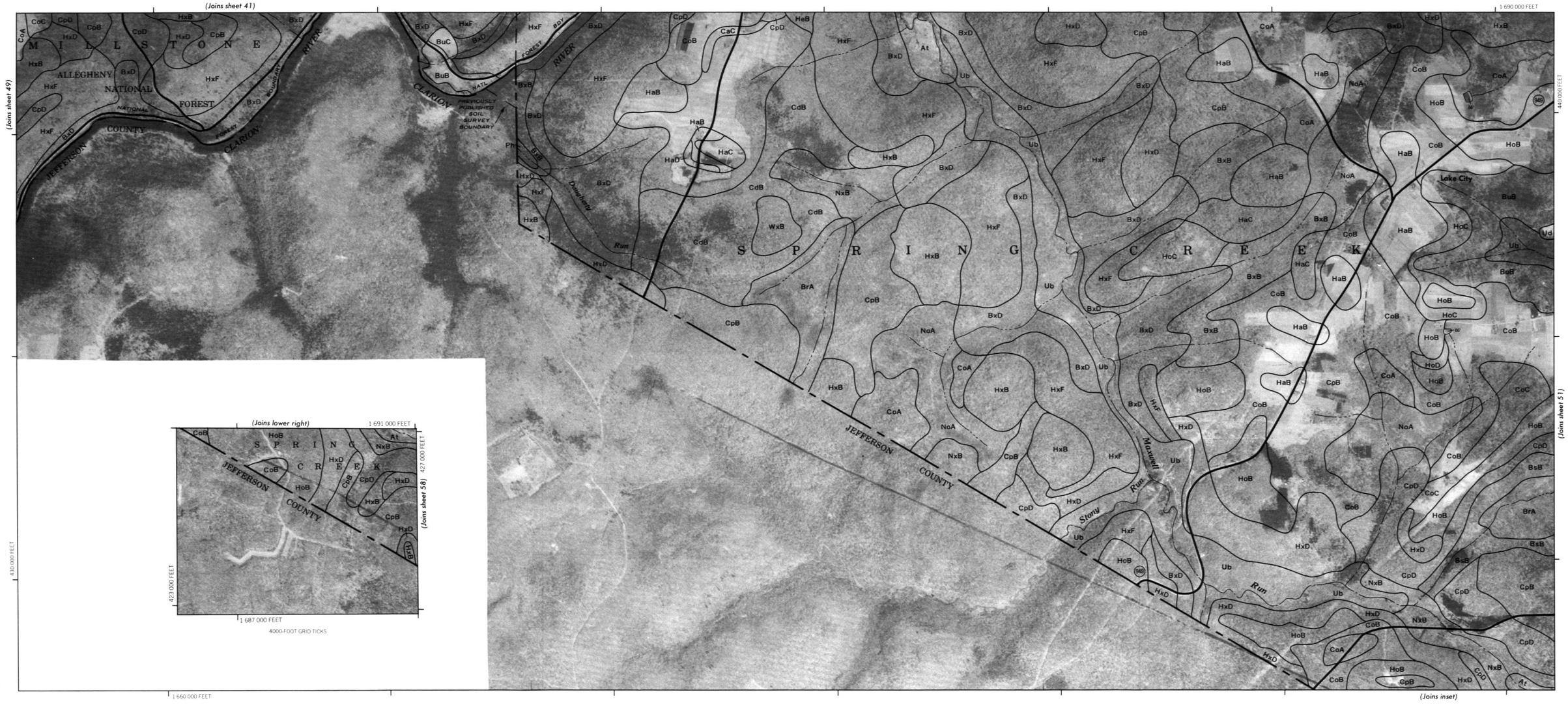
SCALE 1:20 000


N
(Joins sheet 39)
HxF
1 930 000 FEET
455 000 FEET
(Joins sheet 47)
(Joins inset, sheet 23)
445 000 FEET
1 900 000 FEET
(Joins sheet 57)
LUMBER
GROVE
HILLGIBSON
GROVE
Brooks Run
Gravelly Run
Lick Island Run
Grove Run
Tanglefoot Run
Joes Run
SINNEMAHONING
water
Short Bend Run
CREEK
Woodrock Run
Bb
Kephart Hollow
Bronson
FORK
FIRST
872
1 MILE
1 KILOMETER
SCALE 1:20 000

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

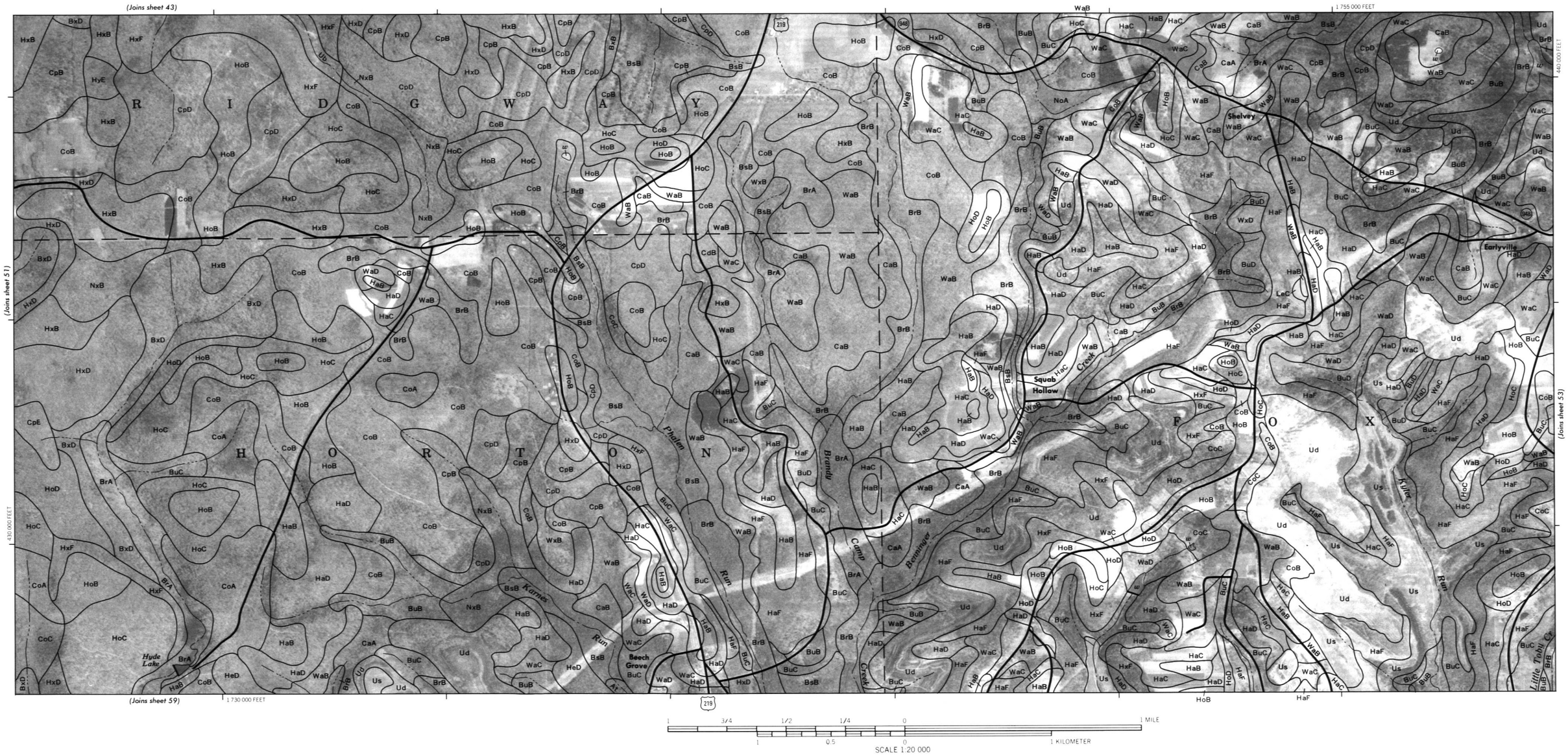
SCALE 1:20 000


N
(Joins sheet 41)
(Joins sheet 49)
1 690 000 FEET
440 000 FEET
(Joins sheet 51)
430 000 FEET
1 660 000 FEET
(Joins inset)
MILLSTONE
ALLEGHENY NATIONAL FOREST
CLARION RIVER
JEFFERSON COUNTY
CLARION COUNTY
FOREST BDY.
BOUNDARY
NATIONAL FOREST
PREVIOUSLY PUBLISHED SOIL SURVEY BOUNDARY
Dougherty Run
SPRING CREEK
Lake City
Story Run
Maxwell Run
Run
(Joins lower right)
(Joins sheet 58)
1 691 000 FEET
427 000 FEET
423 000 FEET
1 687 000 FEET
4000-FOOT GRID TICKS
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

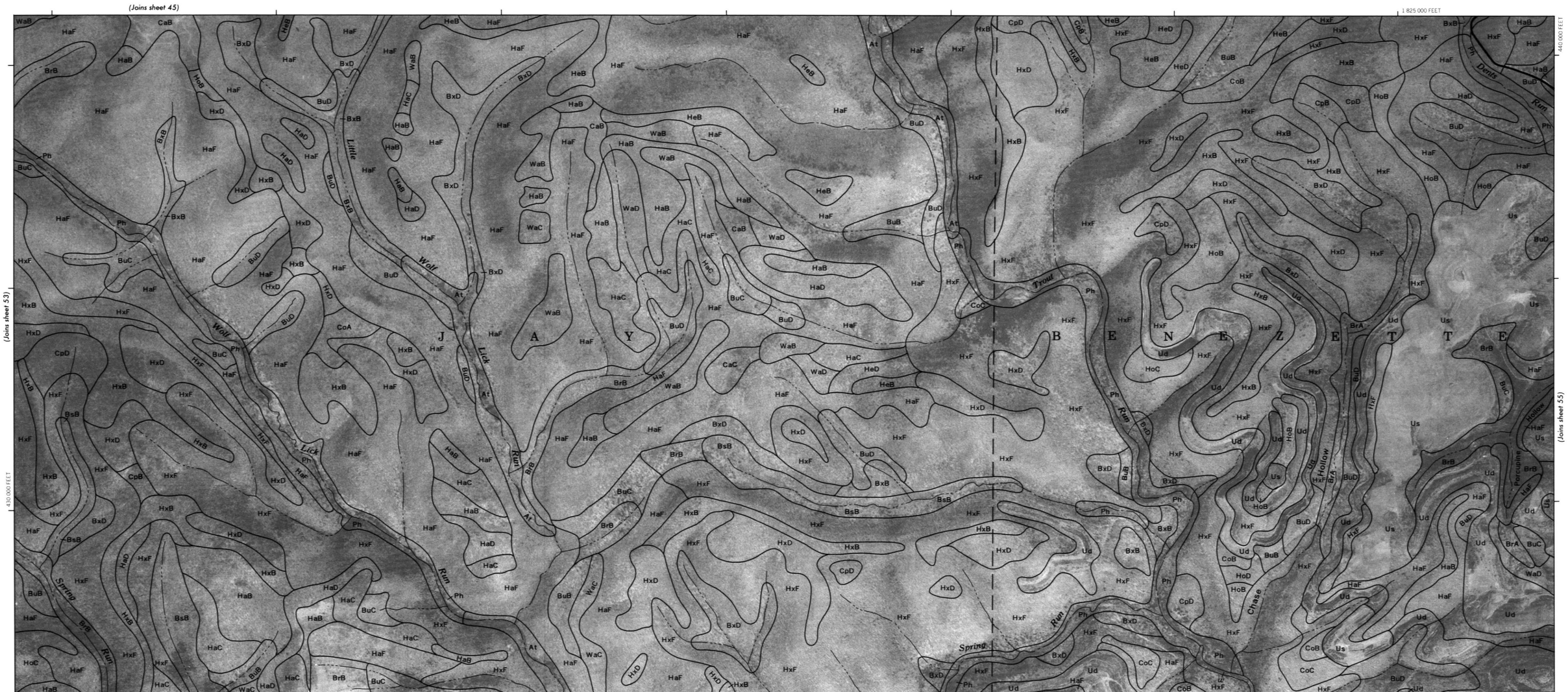
SCALE 1:20 000

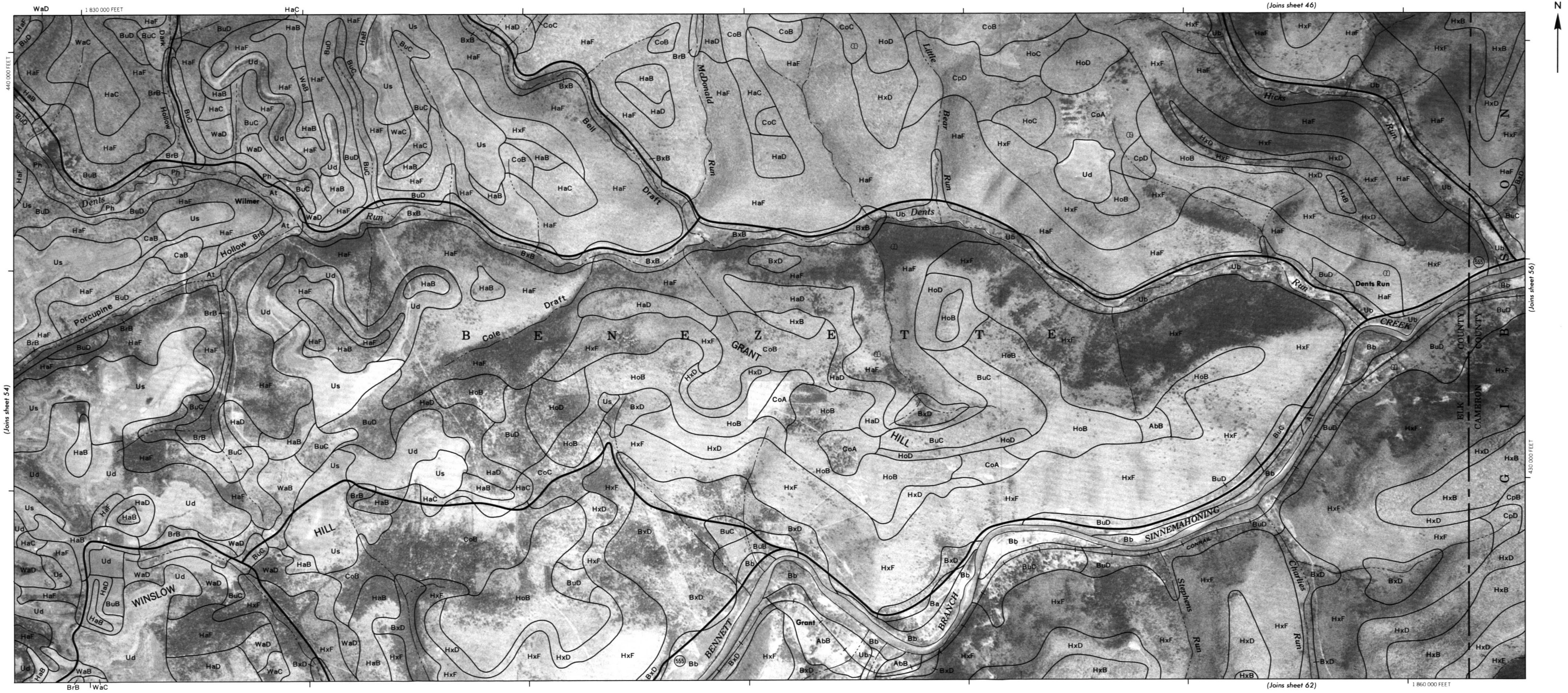
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER


N
(Joins sheet 43)
1 755 000 FEET
(Joins sheet 51)
(Joins sheet 53)
430 000 FEET
440 000 FEET
(Joins sheet 59)
1 730 000 FEET
RIDGWAY
HORTON
FOX
Hyde Lake
Beech Grove
Squab Hollow
Shelvey
Earlyville
Phelen Run
Brandy Camp Run
Bennett Run
Karnes Run
Kyle Run
Little Toby Cr.
Toby Creek
219
948
1 MILE
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000


1 760 000 FEET
(Joins sheet 44)
N
440 000 FEET
(Joins sheet 52)
(Joins sheet 54)
430 000 FEET
(Joins sheet 60)
1 790 000 FEET
Dagus
Kersey
Paine
Fairview
Dagus Mines
Coal Hollow
Red Hill
Wolf Lick Reservoir
Beaver Run
Daguscahonda Run
Toby Creek
Little Toby Creek
Byrnes Run
Lick Run
Spring Run
Horseshoe Bend
Aumann Hollow
F O X P J A Y
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 45)
1 825 000 FEET
1 840 000 FEET
(Joins sheet 53)
(Joins sheet 55)
430 000 FEET
1 795 000 FEET
(Joins sheet 61)
Little Wolf Run
Wolf Lick Run
Lick Run
Spring Run
Trout Run
Run
Derits Run
Hollow
Chase
Percupine
Spring
JAY BEE NEE ZEE TEE
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000



1 3/4 1/2 1/4 0 1 MILE

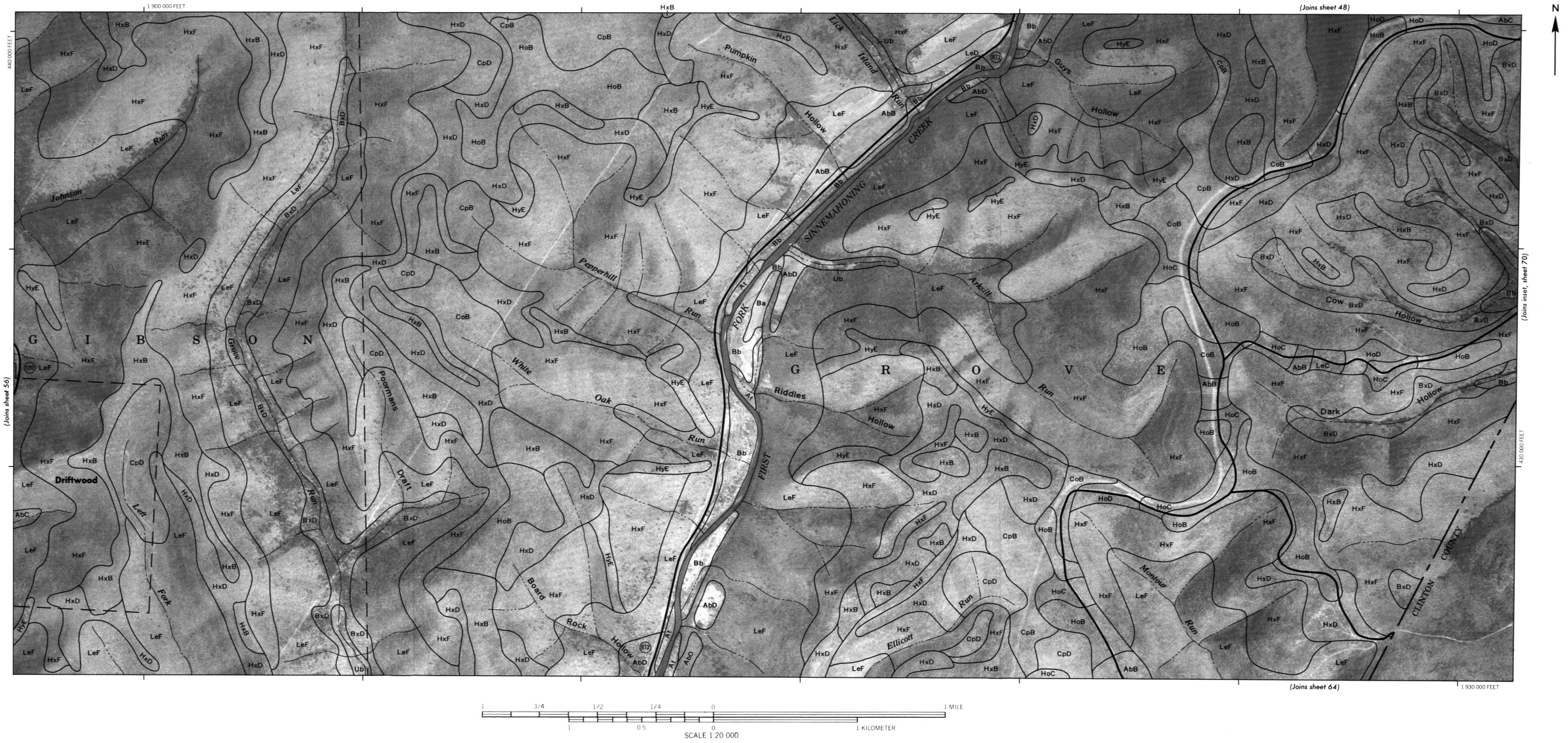
1 0.5 0 1 KILOMETER

SCALE 1:20 000

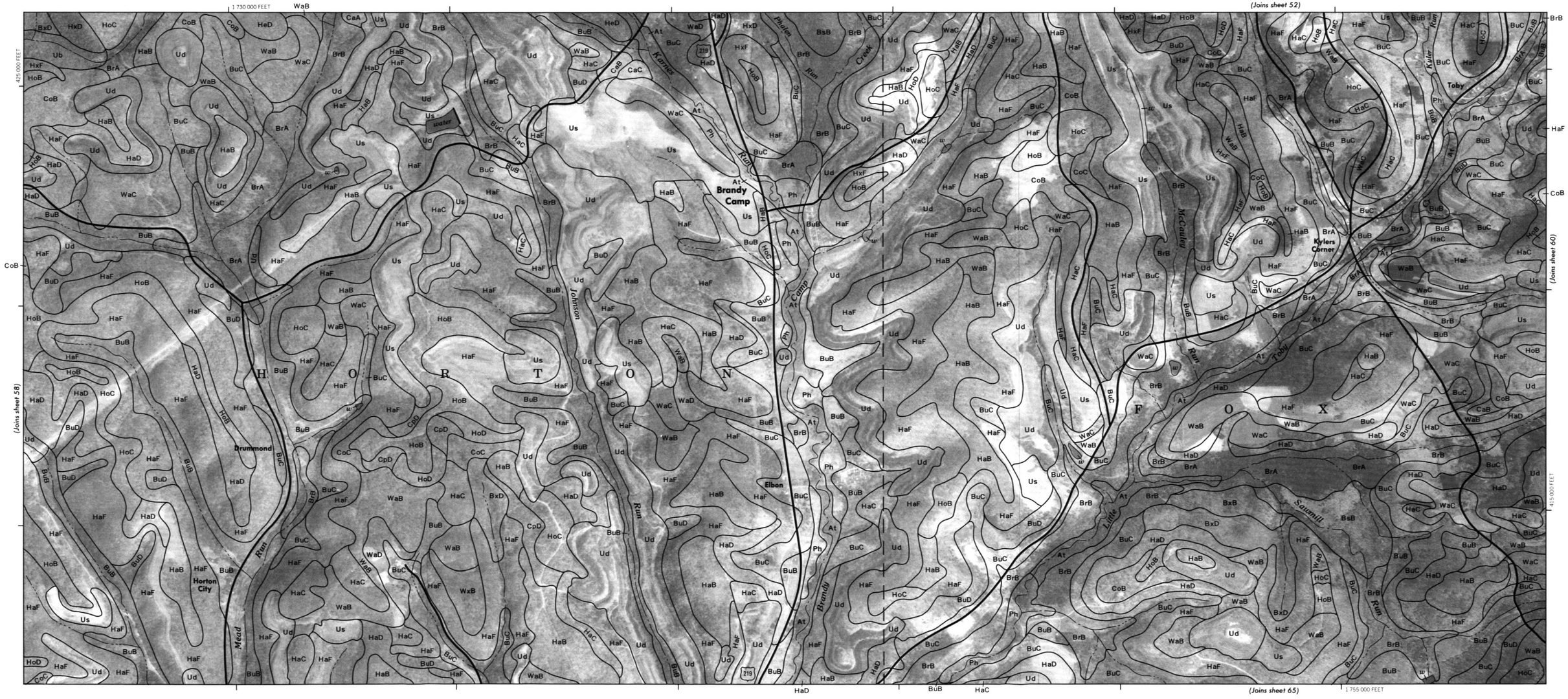
1 3/4 1/2 1/4 0 1 MILE

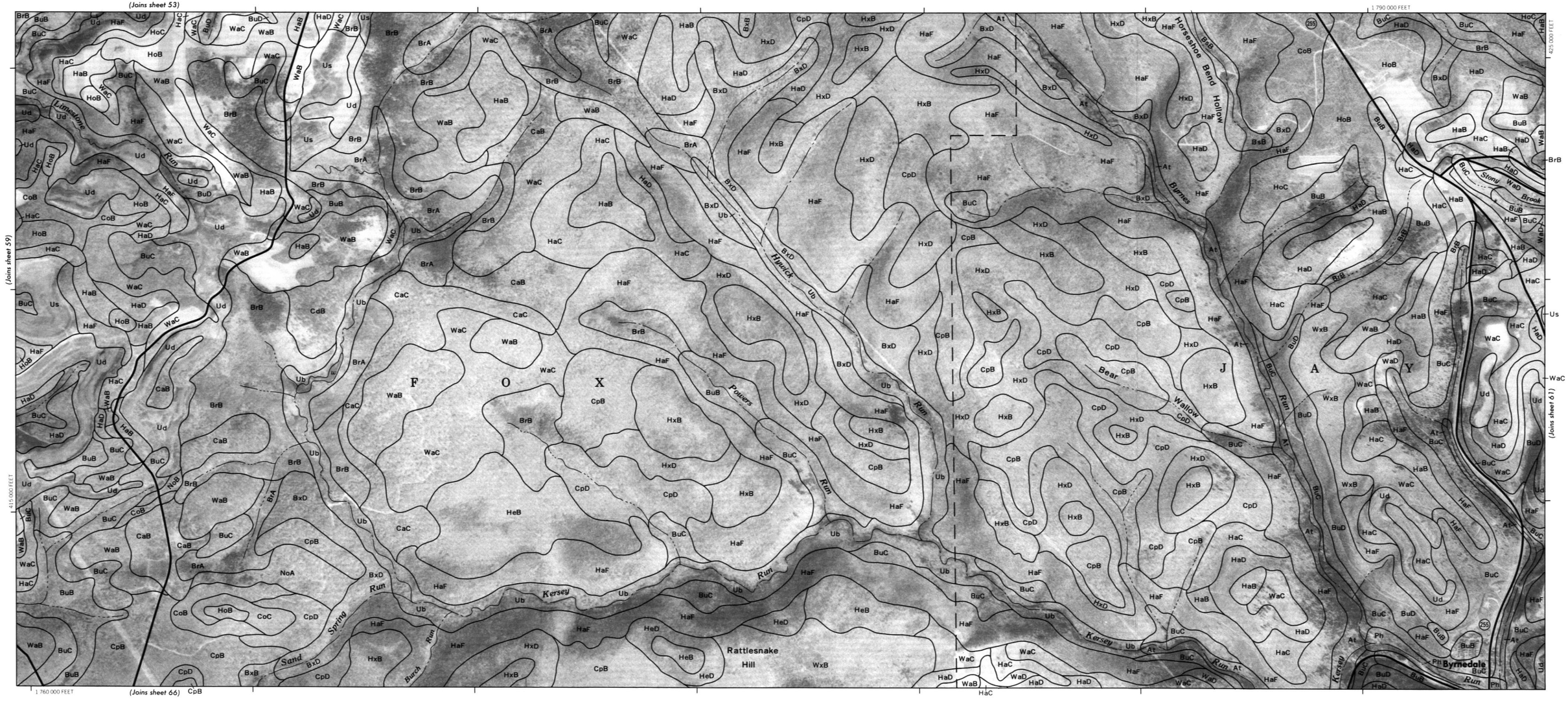
1 0.5 0 1 KILOMETER

SCALE 1:20 000


57
N
1 900 000 FEET
(Joins sheet 48)
440 000 FEET
(Joins sheet 56)
(Joins inset, sheet 70)
430 000 FEET
(Joins sheet 64)
1 930 000 FEET
G I B S O N
G R O V E
Driftwood
Johnson Run
Grove Run
Left Fork
Poormans Draft Run
White Oak Run
Pepperhill Run
Board Rock Hollow
Pumpkin Hollow
Lick Island Run
SINNEMAHONING CREEK
FIRST FORK
Riddles Hollow
Guys Hollow
Arksill Run
Cow Hollow
Dark Hollow
Montour Run
Ellicott Run
CLINTON COUNTY
120
872
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 51)
(Joins inset, sheet 50)
1 725 000 FEET
425 000 FEET
315 000 FEET
1 695 000 FEET
(Joins sheet 59)
(Joins inset, sheet 31)
SPRING CREEK
HORTON
Coward Run
Ohio and Toby Creek
Little Toby Creek
Blue Rock
Vineyard Run
Walburn Run
West Branch
BALTIMORE AND OHIO
CONRAIL
JEFFERSON COUNTY
SCALE 1:20 000
1 MILE
1/2
1/4
0
1 KILOMETER
0.5


N
1 730 000 FEET
1 755 000 FEET
425 000 FEET
415 000 FEET
(Joins sheet 52)
(Joins sheet 58)
(Joins sheet 60)
(Joins sheet 65)
HORTON
FOX
Brandy Camp
Elbon
Toby
Kylers Corner
Drummond
Horton City
Johnson Run
Kurtes Run
Phuten Creek
McCauley Run
Camp Run
Brandy Run
Little Sawmill Run
Mead Run
Toby Run
Kyler Run
water
1 MILE
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000


N
(Joins sheet 53)
(Joins sheet 59)
(Joins sheet 61)
(Joins sheet 66)
1 790 000 FEET
1 760 000 FEET
425 000 FEET
415 000 FEET
FOX
JAY
Limestone Run
Horseshoe Bend Hollow
Byrnes Hollow
Hyatt Run
Powers Run
Bear Wallow Run
Kersey Run
Spring Run
Sand Burch Run
Stony Brook
Rattlesnake Hill
Byrnedale
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

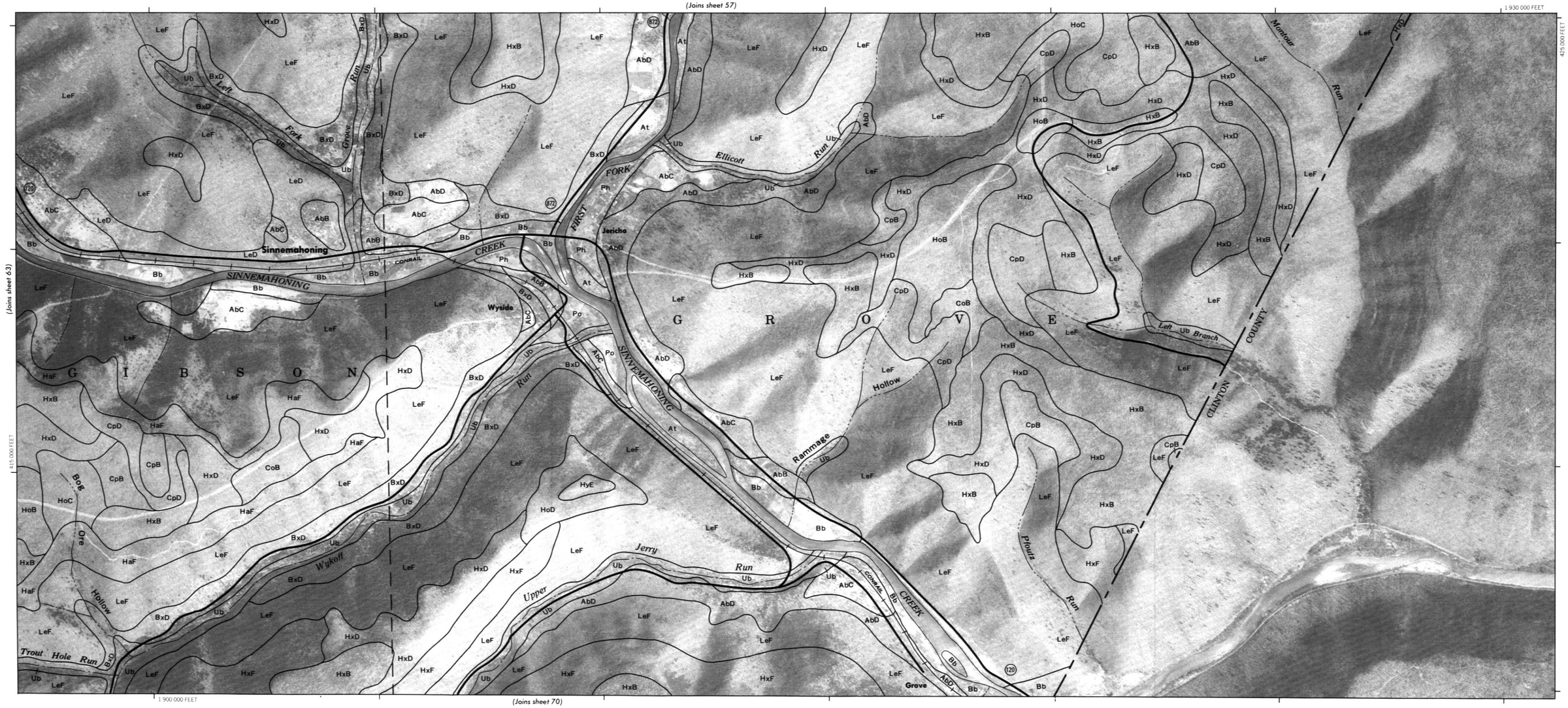

1 795 000 FEET
1 825 000 FEET
425 000 FEET
415 000 FEET
N
(Joins sheet 54)
(Joins sheet 60)
(Joins sheet 62)
(Joins sheet 67)
GRAY HILL
BENEZETTE
Benezette
Bennett Branch Sinnemahoning Creek
Stony Brook
Spring Run
Trout Run
Wall Lick Run
Bakemans Run
Barr Hollow
CONRAIL
1 MILE
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000

1 3/4 1/2 1/4 0 1 MILE

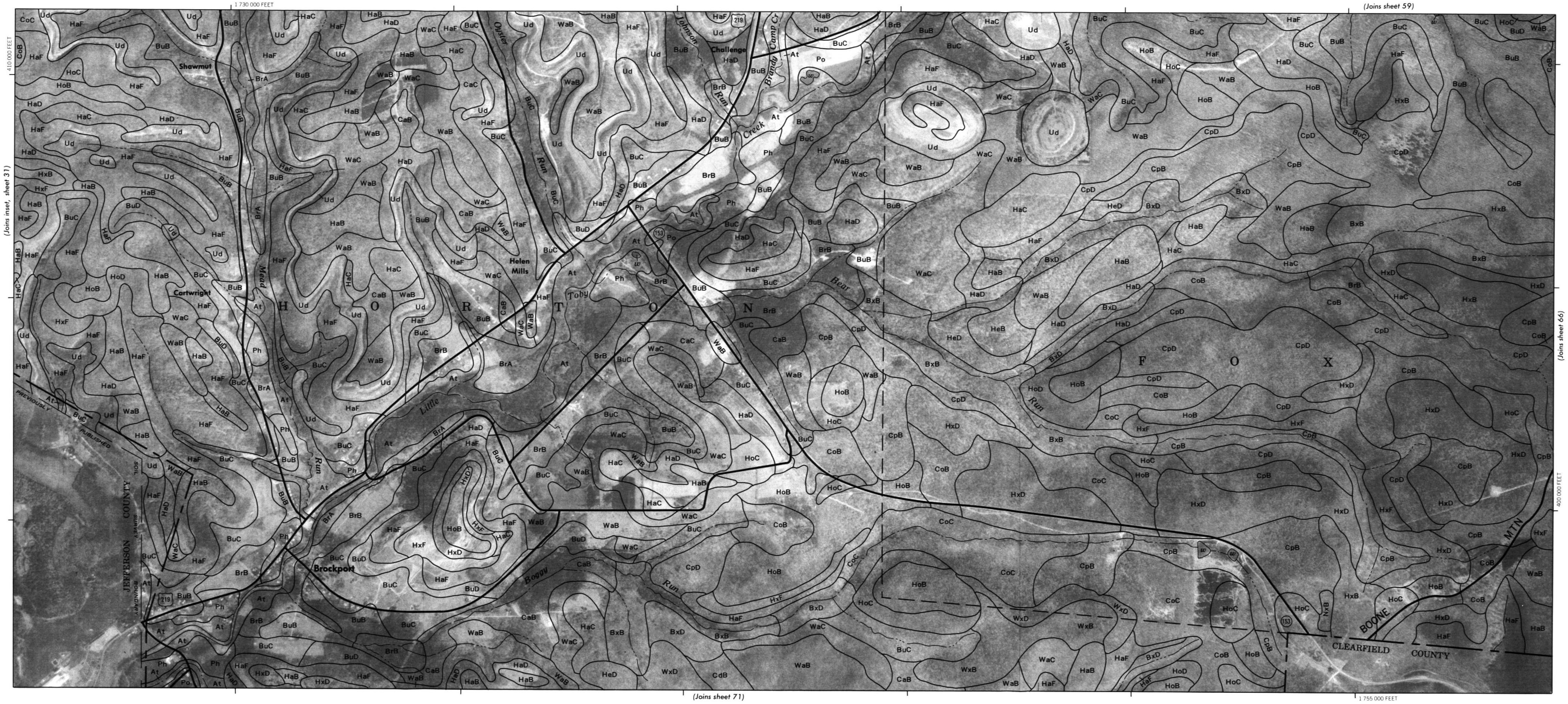
1 0.5 0 1 KILOMETER

SCALE 1:20 000


1 865 000 FEET
425 000 FEET
(Joins sheet 56)
(Joins sheet 62)
(Joins sheet 64)
(Joins sheet 69)
1 895 000 FEET
415 000 FEET
N
CAMERON COUNTY
ELK COUNTY
BENEZETT
GIBSON
Driftwood
Castle Garden
Sinnemahoning
Bennett Branch
Little Dent Run
Horsehead Hollow
Mix Run
Gravel Run
Luck Run
Little Fork
Archie Barr Hollow
Red Mix Run
Nanny Run
Trout Hole Run
Laurel Run
Drake Creek
Sinnemahoning Creek
CREEK
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 57)
1 930 000 FEET
425 000 FEET
(Joins sheet 63)
415 000 FEET
1 900 000 FEET
(Joins sheet 70)
G I B S O N
G R O V E
Sinnemahoning
Wyside
Jericho
Grove
CONRAIL
SINNEMAHONING CREEK
FIRST FORK SINNEMAHONING
Left Fork Grove Run
Ellicott Run
Rummage Hollow Run
Jerry Run
Upper Trout Hole Run
Wykoff Run
Bog Ore Hollow
Montour Run
Left Ub Branch
CLINTON COUNTY
Pfoutz Run
1 MILE
1 KILOMETER
SCALE 1:20 000

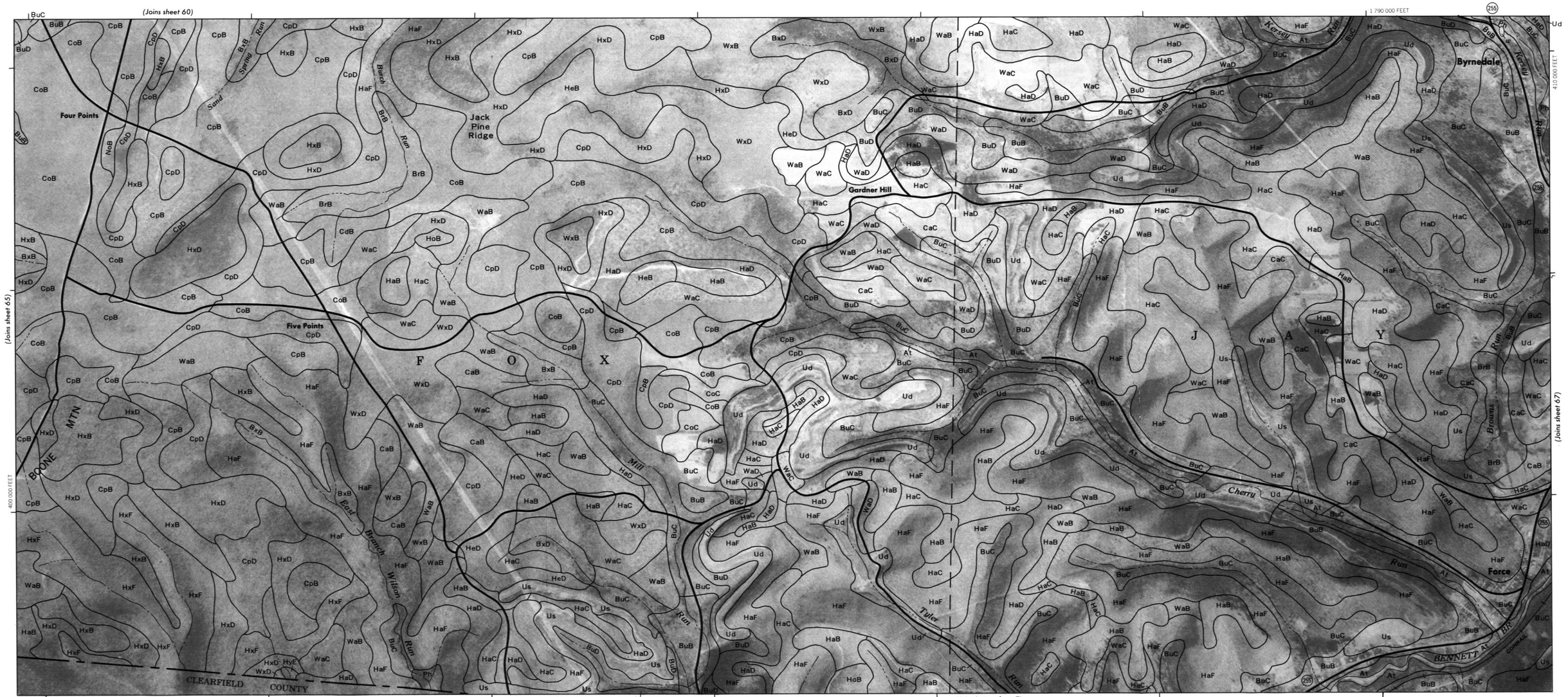
N

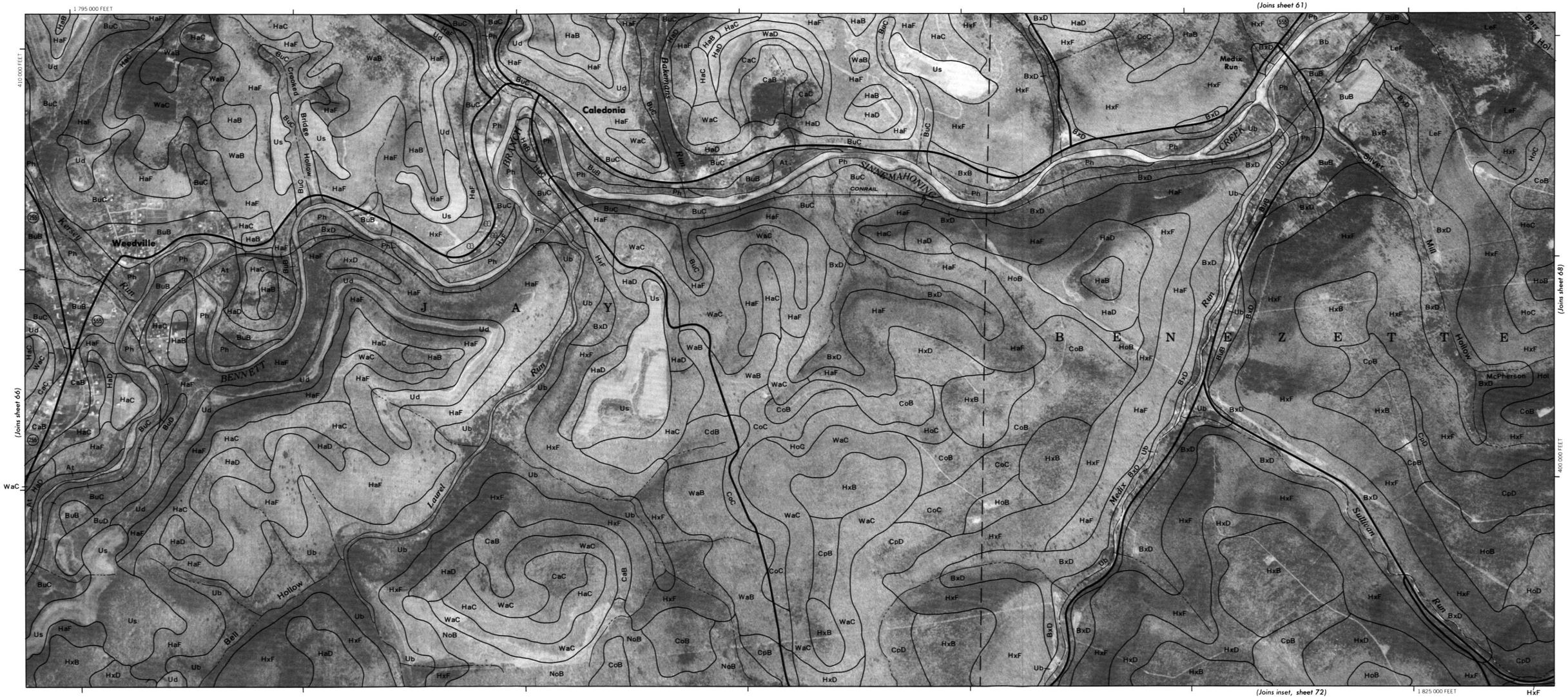


1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


N
(Joins sheet 60)
1 790 000 FEET
410 000 FEET
400 000 FEET
1 760 000 FEET
(Joins sheet 65)
(Joins sheet 67)
(Joins inset, sheet 7)
Four Points
Five Points
Jack Pine Ridge
Gardner Hill
Byrnedale
Force
BOONE MTN
CLEARFIELD COUNTY
FOX
JAY
Sand Spring Run
Birch Run
Mill Run
East Branch Wilson Run
Tyler Run
Cherry Run
Kersey Run
Browns Run
BENNETT BR CONEMAUGH
1 MILE
1 KILOMETER
SCALE 1:20 000



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

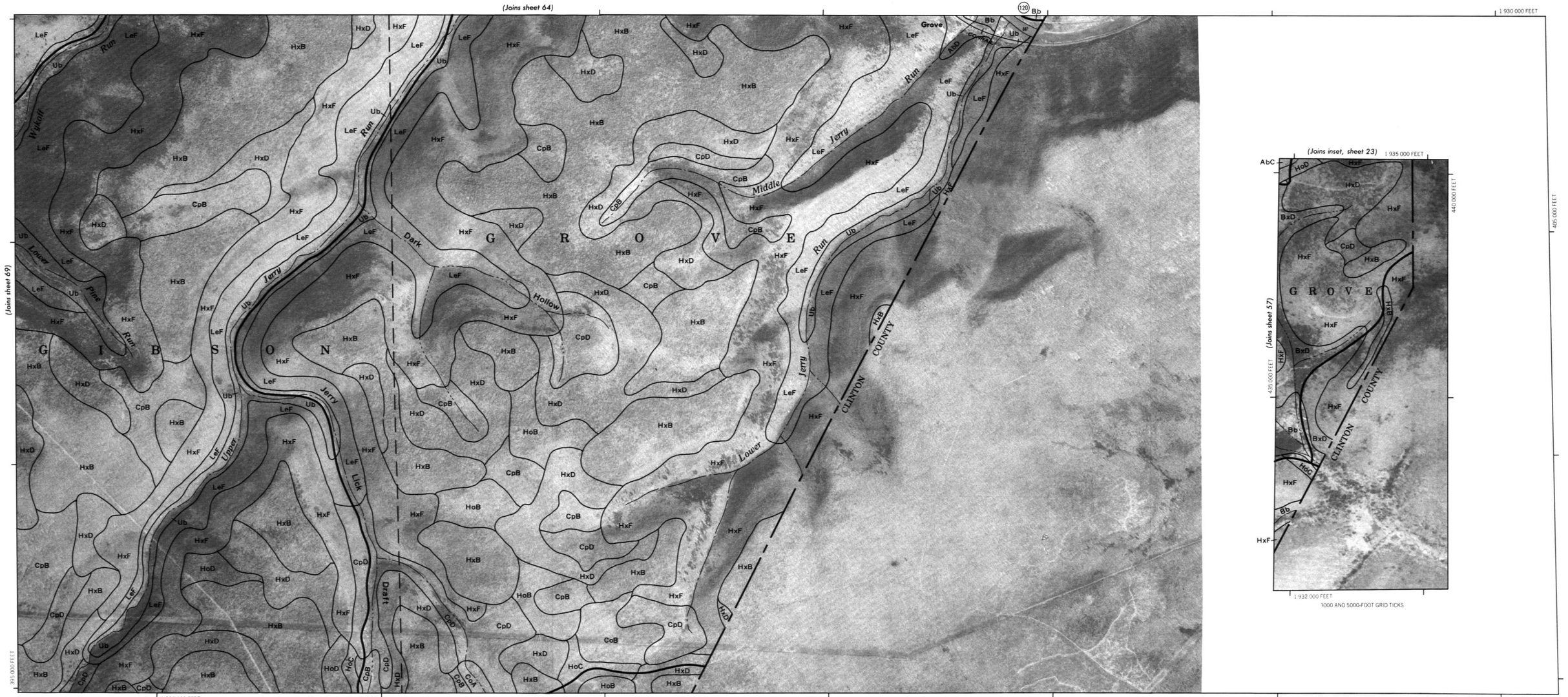
SCALE 1:20 000

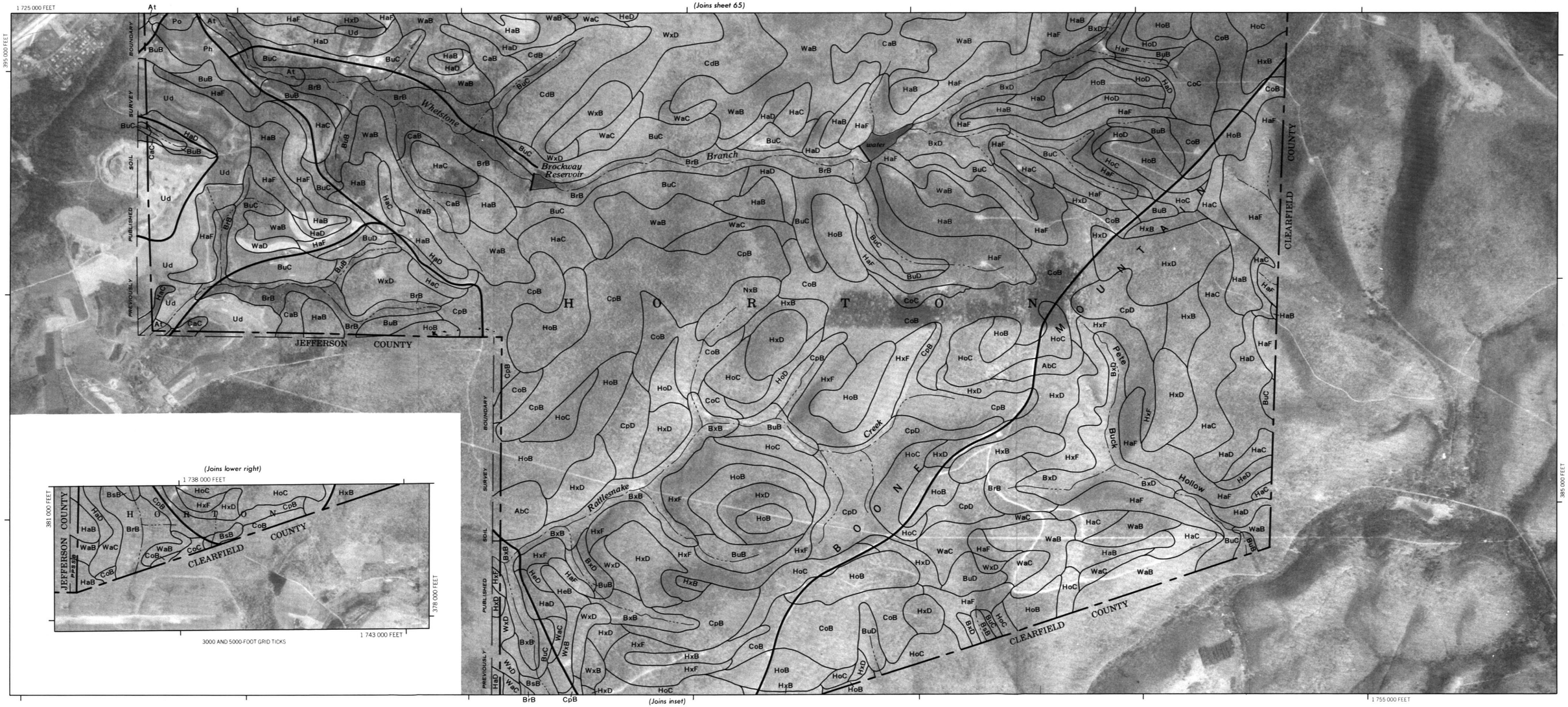
N

1 3/4 1/2 1/4 0 1 MILE

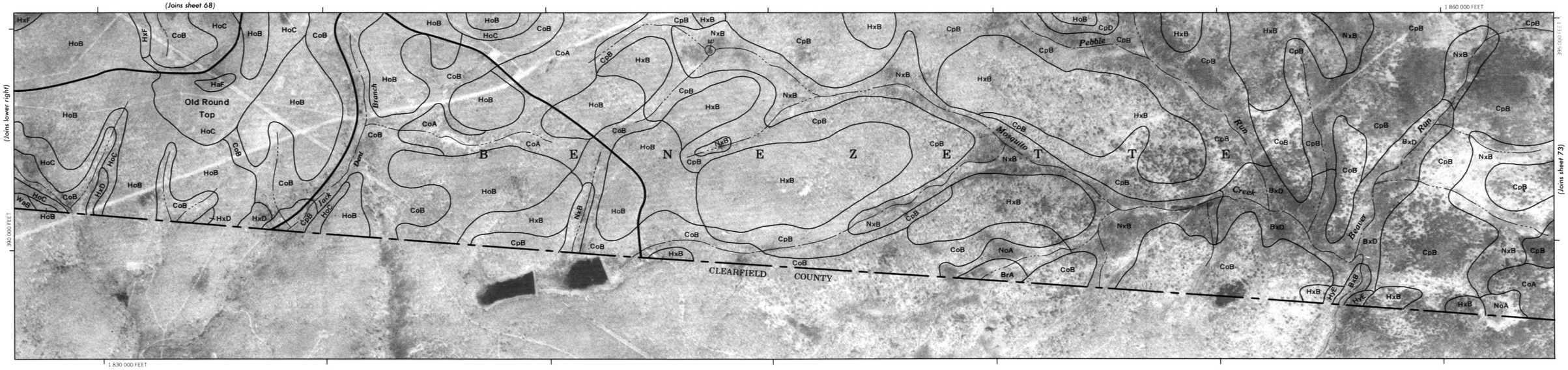
1 0.5 0 1 KILOMETER

SCALE 1:20 000

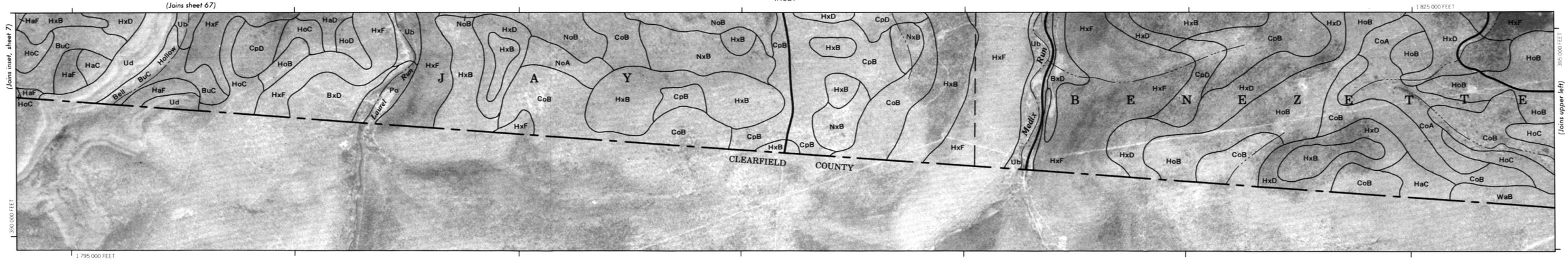

N
(Joins sheet 64)
(Joins sheet 69)
(Joins inset, sheet 22)
1 900 000 FEET
1 930 000 FEET
395 000 FEET
405 000 FEET
440 000 FEET
G I B S O N
G R O V E
Grove
CLINTON COUNTY
Wykoff Run
Lower Pine Run
Jerry Run
Dark Hollow
Middle Jerry Run
Lower Jerry Run
Upper Lick Run
Draft
LeF
HxF
HxB
HxD
Ub
CpB
CpD
HoB
HoC
HoD
CoB
CoA
Bb
AbC
BxD
(Joins inset, sheet 23)
(Joins sheet 57)
1 935 000 FEET
435 000 FEET
1 932 000 FEET
1000 AND 5000-FOOT GRID TICKS
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

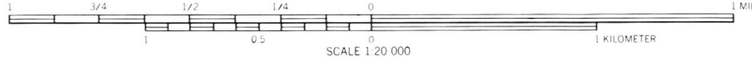

1 725 000 FEET
(Joins sheet 65)
395 000 FEET
385 000 FEET
1 755 000 FEET
N
JEFFERSON COUNTY
CLEARFIELD COUNTY
HORTON
BOONE
MOUNTAIN
Whetstone Branch
Brockway Reservoir
Rattlesnake Creek
Peter Buck Hollow
water
BOUNDARY
SURVEY
SOIL
PUBLISHED
PREVIOUSLY
(Joins lower right)
1 738 000 FEET
381 000 FEET
378 000 FEET
1 743 000 FEET
3000 AND 5000-FOOT GRID TICKS
(Joins inset)
1 MILE
1 KILOMETER
SCALE 1:20 000

N



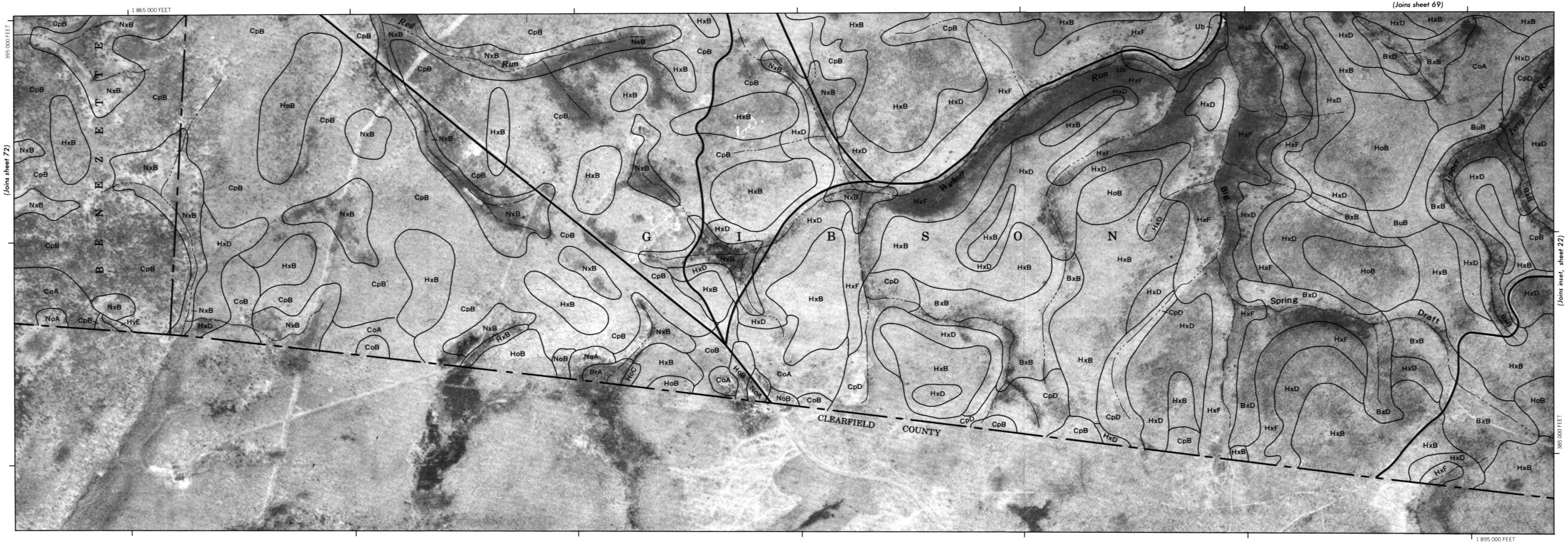
INSET

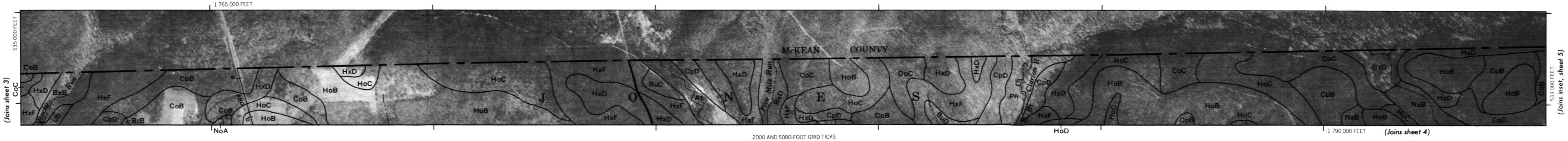




SCALE 1:20 000

N





2000 AND 5000-FOOT GRID TICKS

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000